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SOME COMPUTER APPLICATIONS FOR THE WORK INPUT AND CONTROL PHASES OF THE MAINTENANCE CYCLE OF NAVY PUBLIC WORKS CENTERS

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SOME COMPUTER APPLICATIONS FOR THE WORK INPUT AND CONTROL PHASES OF THE MAINTENANCE CYCLE OF NAVY PUBLIC WORKS CENTERS

by

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ABSTRACT

Public Works Centers have recently emerged as a new type of organization for accomplishment of the Navy's maintenance function at large naval bases. They are distinctly different from the older organizations for maintenance. Chapter I reviews this difference.

The purpose of this study is to review the various phases of planning and control of the maintenance function in the new PWC environment, yet considering older organizational methods. Chapter II describes current methods and Chapter III presents a proposed system for improving work input and control functions. The intent is to provide a reasonable and basic approach to these functions through the use of automatic data processing equipment.

The PWCs have great potential for use of new computer systems. This potential, which has been recognized by the Navy Facilities Engineering Command, is reviewed in the study. Although specific proposals are limited to work input and control, other potential applications are discussed in Chapter IV.

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Chapter I

The Problem

Theoretical Background. The Facilities Engineering Command (NAVFAC) is charged by the Secretary of the Navy with responsibility for technical direction of programs for the effective maintenance of real property of the Navy.[1] This responsibility has been carried out chiefly through the controlled maintenance program which has been developed since World War II. The early efforts included procedures to be used by activity public works departments. There have since been some major changes, not only in procedures, but also in the organizations for the accomplishment of maintenance. The most notable has been the evolution of the Navy Public Works Centers (PWCs) as separate commands at large naval complexes. As an economy measure on 30 June, 1960, the Secretary of the Navy directed consolidation of public works departments of activities at large naval bases into the separate PWCs.[2]

A PWC is a distinct naval command and a public works department is a part of another command. A PWC does work for other commands while a public works department performs its services within a command. The PWC compares with a contracting company and a public works department is similar to the maintenance department of an industrial concern.

As of 24 August, 1965, the Navy had chartered six PWCs to operate under the Navy Industrial Fund (NIF) accounting procedures. This system of accounting was one of the outgrowths of the National Security Act Amendments of 1949.[1] This legislation makes it possible for industrial-commercial type activities in the military departments to use working capital provided by revolving funds to finance goods and services ordered by customers (other military commands and activities) on a reimbursable basis. The effect of the installation of the NIF accounting procedures in these PWCs has been to create a buyer - seller relationship with customers. This is not truly established at activities operating under the older appropriation accounting system. In effect, under the NIF system, the PWCs provide facilities maintenance and other services to customer activities in much the same manner as would a private contractor.

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[1] United States Navy Department, Bureau of Yards and Docks, Maintenance Management of Public Works and Public Utilities: Change 2, (NAVDOCKS P-321: Washington, D.C. December 1962), p.2.

[2] United States Navy Department, Office of the Secretary, Consolidation of Public Works Functions at Naval Complexes with Public Works Centers, SECNAV Instruction 5450.9 (Washington, D.C., 30 June 1960).

The Problem. Since controlled maintenance procedures had been designed for use by activity public works departments using appropriation accounting systems, some of these were not appropriate at the new NIF PWCs. Although much has been done[2] to adapt the program for use by the NIF PWCs there are still many unresolved conflicts.

Definition of Key Terms. Appendix A contains a glossary of pertinent definitions. Most are words and concepts applicable to Navy public works affairs. Those who are not familiar with this area should review Appendix A before proceeding.

Major changes due to establishment of NIF PWCs.

1. _Facilities Maintenance._ Formerly naval base activities maintained their own facilities as listed in the fixed assets accounts. Now

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[1] Harry M. Dewitt Jr., _Comptrollership in the Armed Forces_ (Washington: Institute of Engineering, 1952), p. 48.

[2] One of the most comprehensive efforts in this area has been the Handbook of Operating Procedures for Public Works Centers, NAVDOCKS P-187, promulgated by BUDOCKS on 24 August 1965.

PWCs perform this service on a contractual basis.

2. Continuous inspection. Activities formerly performed their own inspection for plant property condition. Now this is done for them by the PWCs. Cost of inspection is borne by the NAVFAC.

3. Maintenance Budgeting. In the past most activities prepared their own maintenance budgets largely on the basis of historical records. Now, due to the integrated relationship between the PWCs and their customer activities, the maintenance budgets are prepared by a joint effort. The PWCs determine what should be done, by inspection, and advise customers of deficiencies noted. In making up their budgets the customers add the cost of correcting these deficiencies to other known requirements.

Statement of Purpose. The purpose of this study is to investigate the relationship between facilities maintenance, continuous inspection and maintenance budgeting in a NIF PWC environment and to illustrate how some easily used computer programs can improve the work input and control phases of the maintenance cycle.

Assumptions.

1. All NIF PWCs will have electronic data processing systems similar to the Honeywell H-200 system currently being installed at PWC, San Diego. It is assumed also that sufficient machine time will be available for the processes recommended herein without additional equipment or overload of the data processing organization.[1] Even with a large number of data cards none of the three programs proposed in Chapter III should take over five minutes of computer time.

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[1] Discussions between the author and Miss Katherine Moran, head of the onsite NAVFAC computer install-team at PWC, San Diego, on 2 April, 1966, indicated that sufficient machine time would be available.

2. Detailed and accurate estimates are necessary for the proper functioning of the proposed system. It is assumed that combination Planner - Estimator/Inspector ratings[1] will be used for continuous inspection purposes. This is consistent with a current trend for conversion to the combination ratings. If the combination ratings were not used, and only rough estimates were made by inspectors, the budget would reflect any inaccuracies and control would be more difficult.

3. The study assumes that all NIF PWCs are capable of using essentially the same procedures in connection with plant accounting, budgeting, continuous inspection and work accomplishment. It is recognized that at the present time many of the PWCs use different procedures. However, the system described in Chapter III is not only basic but also flexible. Individual PWCs will find it easy to adapt these basic methods to fit their specific needs.

Chapter Conclusion. Within the past six years NIF PWCs have evolved as a new type of organization for accomplishment of the Navy maintenance function. The difference between these PWCs and activity public works departments has been described. Since most controlled maintenance procedures were designed for the latter they do not always apply to the former. Chapter II will review existing methods and outline some of the unresolved conflicts. Chapter III proposes solutions in specific areas.

[1] See Chapter III for details.

Chapter II

A Review of Current Methods

The scope of this report is limited to management and control systems at NIF PWCs. Tnis segment will review only those current applications most relevant to the study. Since the study covers the areas of budgeting, plant accounting, inspection and workload planning the review will be necessarily broad.

There are many conflicts. The majority stem from the basic differences between an activity public works department and a NIF PWC. This was discussed in the introduction. Although academic writings on management are applicable in general, we are more concerned here with specific Navy public works management. A number of instructions and technical manuals have been promulgated by the NAVFAC which have direct application. The purpose of this section is to summarize significant features of these Navy documents. The review will be difficult because of the conflicts. It should be recognized that both _Maintenance Management of Public Works and Public Utilities_ and _Public Works Management Improvements_ were written for a public works department as opposed to a PWC. Although _The Handbook of Operating Procedures for Public Works Centers_ was written for PWCs it will be difficult to implement because of conflicts with existing systems. Finally, there are problems in connection with plant accounting and budgeting procedures at PWCs. A later section will try to resolve some of the issues. No study of this nature could possible resolve them all.

The following paragraphs include a brief description of _Maintenance Management of Public Works and Public_ Utilities, _Public Works Management Improvements_ and _The Handbook of Operating Procedures for Public Works Centers_. More detailed descriptions of these documents and plant accounting and budgeting procedures will follow.

There has been general recognition of the need in the Navy Department for improving maintenance management.[1] Recognition of this need led to the development of improved controlled maintenance procedures. These procedures are included in Maintenance Management of Public Works and Public Utilities (NAVDOCKS P-321). This manual provides the foundation for the entire controlled maintenance program.

Public Works Management Improvements (NAVDOCKS P-99) promulgated in 1964 is a more recent directive on the philosophy of public works management. It supplements NAVDOCKS P-321 and replaces some reporting procedures from it.

Reports with application at NIF PWCs will be reviewed later.

The Handbook of Operating Procedures for Public Works Centers (HOOP) published in 1965 is also covered. This handbook represents a major effort in establishing operating procedures for the NIF PWCs. HOOP establishes guidelines for PWCs utilizing automatic data processing equipment. Although the PWCs do not now have computer systems, present plans are that "Honeywell H-200" systems are being installed or will be installed at these activities in the near future. HOOP does not provide the detail necessary for the immediate use of the computer systems.

The more detailed description of these documents follows.

A. Maintenance Management of Public Works and Public Utilities NAVDOCKS P-321:

The scope of the manual is as follows:

> Controlled Maintenance, as outlined in this publication, is the application of proven management and industrial engineering principles to the maintenance and operation of public works and public

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[1] NAVDOCKS P-321 op. cit. p.12.

> utilities. The significance of Controlled Maintenance is explained, as are the basic concepts, elements of control, and extent of control. Also included are procedures and other criteria to assist in the implementation of Controlled Maintenance.[1]

The following are assigned responsibilities for Controlled Maintenance:

1. The Navy Department. The Secretary of Defense has directed all the Military Departments to establish effective maintenance management programs.

2. The Navy Facilities Engineering Command. Responsibility is assigned by the Secretary of the Navy.

3. Commanding Officers. Maintenance management is a command function. This would include Commanding Officers of PWCs.

4. The Maintenance Control Division. This is interpreted to mean also Maintenance Control Departments of PWCs. The entire effort of these organizations is devoted to controlled maintenance.

5. Other. Other components of public works organizations have specific responsibilities for the Controlled Maintenance Program. These components include planning and estimating, inspection, work reception and control, administrative, design and maintenance organizations.

Background and Trends in Controlled Maintenance. NAVDOCKS P-321 outlines both the history and trends of maintenance management for both private industry and the Navy. A synopsis of this background data is important because of its direct relationship to the study. Methods of planning and control of maintenance work have developed rapidly, particularly since World War II.

In the earlier days of industry, maintenance was of two types, housekeeping and breakdown. Housekeeping maintenance included the limited effort expended by productive forces in the maintenance area. Breakdown maintenance meant waiting to make repairs until the machine or facility failed. Standards were far below those of the present day. These early methods reflected an almost complete lack of planning.

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[1] _Ibid._, p. 1.

Economic necessity and pressure from Washington have provided motivation for improved maintenance management. In the first chapter of their book Principles of Industrial Management[1] Alford and Beatty emphasize the importance of mechanization in the development of industrial productivity. NAVDOCKS P-321 recognizes improved maintenance methods as well as other factors such as mechanization and engineered performance standards as significant in the development of improved productivity.

One thing is quite clear. If only methods of repair had been improved there would have been no noticeable improvement over the old system of breakdown maintenance. Maintenance productivity has increased from 30 to 70 percent[2] by implementing controlled maintenance procedures. This has resulted from such developments as work input control, scheduling and cost analysis as well as improved methods.

NAVDOCKS P-321 illustrates the pattern of maintenance management by listing certain rules for maintenance which have been used by a typical large industrial concern for some time. From that list I have taken the following items which I feel are significant to this study:

1. Use a work order system.
2. Keep equipment records.
3. Analyse and plan jobs.

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[1] L. P. Alford and H. Russell Beatty, Principles of Industrial Management (New York: The Ronald Press Company, 1951), p. 3.

[2] NAVDOCKS P-321, op.cit., p. 12.

4. Make forecasts.

5. Prepare schedules.

6. Set up a manpower control.

7. Set up a preventive maintenance inspection program.

8. Use budgetary control.

Developments in the Naval Shore Establishment. Although for years very little thought was given to the importance of maintenance control the progress in the past 10 years has been rapid. Methods in use at naval shore activities, in the author's experience, seem to be on a par with industry. The following developments have had a strong influence on the progress made by the Navy:

1. Growth of the naval shore establishment.

2. Rising costs of maintenance.

3. Poor condition and age of facilities, many of which were constructed during World War II.

4. Readiness requirements.

5. Congressional requirements for better justification of funds.

Effective Facilities Maintenance. In general terms NAVDOCKS P-321 requires the application of the management functions of planning, organizing, staffing, directing and controlling. This means we determine what is to be done, who is to do it and when it is to be done. This is the work input control phase. The execution and appraisal phases follow. We must keep in mind that a public works organization performs a service function in support of activity or fleet operations. All phases of the maintenance effort must be coordinated to fulfill operational requirements.

Methodology of Controlled Maintenance. Those readers who are familiar with the Navy's Controlled Maintenance Program need not be concerned with this section. However, an understanding of the system is essential to the study. A summary of important features follows.

First an inventory of facilities must be taken so that we have an accurate record of what is to be maintained. Standards must be available before a determination can be made on whether or not a facility requires maintenance. We then inspect the facilities listed in the inventory against the standards. This is the Continuous Inspection Program. The work generated by inspection is summarized on an inspection report. A sample is shown in Appendix B.

Work must be authorized by an appropriate official before it can be done. NAVDOCKS P-321 indicates a method of authorization for a public works department. This method is not appropriate for a NIF PWC. To avoid confusion the NAVDOCKS P-321 method will not be summarized. Instead, to provide continuity, the PWC method is illustrated briefly as follows:

1. PWC performs inspection. The inspection report is then forwarded to the customer activity.

2. The customer activity reviews the inspection report in light of fund availability and relative need. If it is determined that the work should be done the customer initiates a work request. This work request is forwarded to the PWC together with an appropriate funding document. The work request and funding document constitute the necessary authorization for the PWC to proceed with the work. See Appendix C for a sample work request form, NAVDOCKS 11014/2(7-65).

The Public Works Center Organization. Figure 2-1 shows the current standard PWC organization. The Maintenance Control Department (code 300 group) has primary responsibility for the maintenance planning functions.

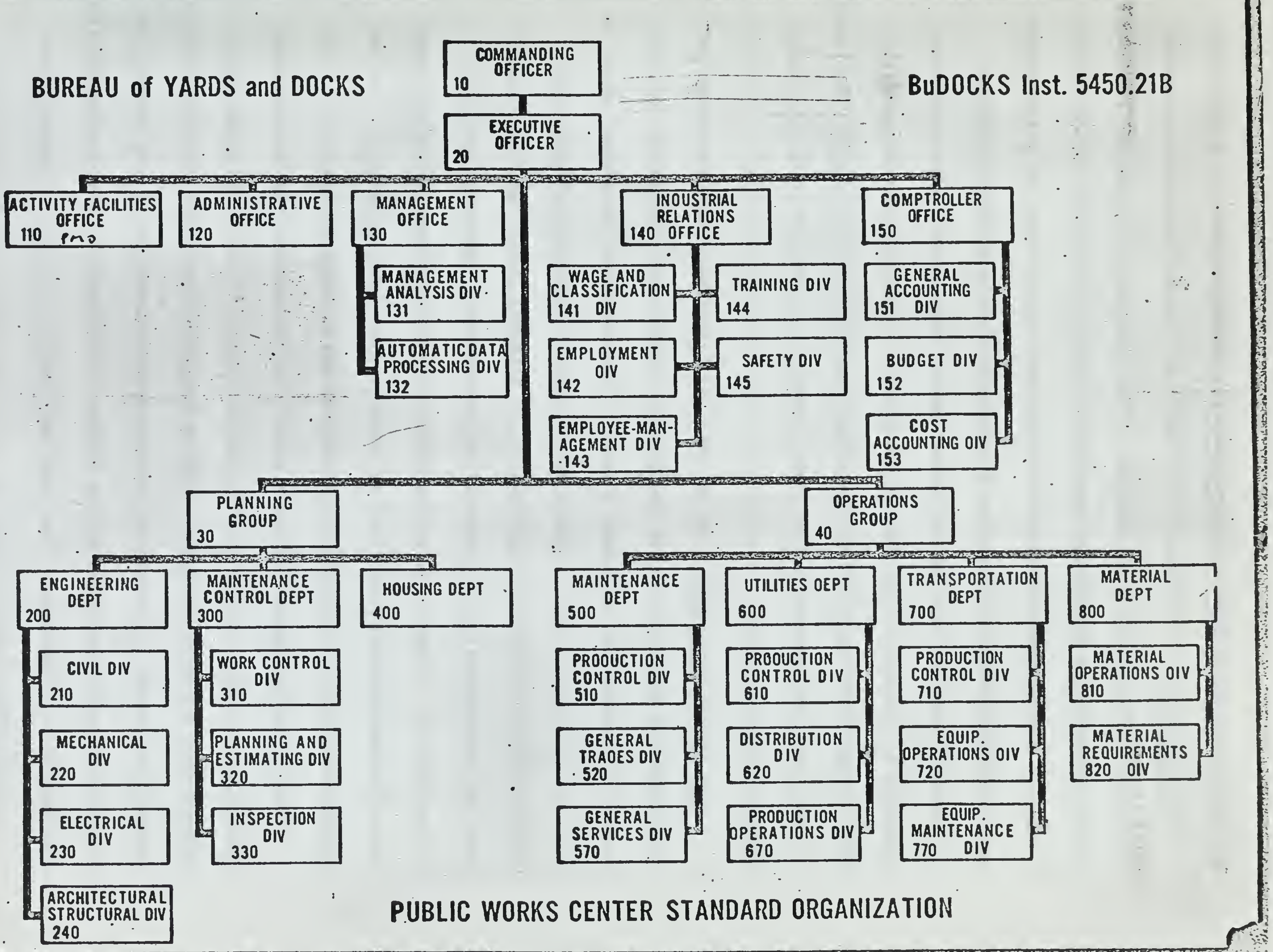
BUREAU of YARDS and DOCKS
BuDOCKS Inst. 5450.21B
COMMANDING OFFICER 10
EXECUTIVE OFFICER 20
ACTIVITY FACILITIES OFFICE 110
ADMINISTRATIVE OFFICE 120
MANAGEMENT OFFICE 130
MANAGEMENT ANALYSIS DIV 131
AUTOMATIC DATA PROCESSING DIV 132
INDUSTRIAL RELATIONS 140 OFFICE
WAGE AND CLASSIFICATION 141 DIV
EMPLOYMENT DIV 142
EMPLOYEE-MANAGEMENT DIV 143
TRAINING DIV 144
SAFETY DIV 145
COMPTROLLER OFFICE 150
GENERAL ACCOUNTING 151 DIV
BUDGET DIV 152
COST ACCOUNTING DIV 153
PLANNING GROUP 30
OPERATIONS GROUP 40
ENGINEERING DEPT 200
CIVIL DIV 210
MECHANICAL DIV 220
ELECTRICAL DIV 230
ARCHITECTURAL STRUCTURAL DIV 240
MAINTENANCE CONTROL DEPT 300
WORK CONTROL DIV 310
PLANNING AND ESTIMATING DIV 320
INSPECTION DIV 330
HOUSING DEPT 400
MAINTENANCE DEPT 500
PRODUCTION CONTROL DIV 510
GENERAL TRADES DIV 520
GENERAL SERVICES DIV 570
UTILITIES DEPT 600
PRODUCTION CONTROL DIV 610
DISTRIBUTION DIV 620
PRODUCTION OPERATIONS DIV 670
TRANSPORTATION DEPT 700
PRODUCTION CONTROL DIV 710
EQUIP. OPERATIONS DIV 720
EQUIP. MAINTENANCE 770 DIV
MATERIAL DEPT 800
MATERIAL OPERATIONS DIV 810
MATERIAL REQUIREMENTS 820 DIV
PUBLIC WORKS CENTER STANDARD ORGANIZATION

Figure 2-1

B. Public Works Management Improvements. NAVDOCKS P-99

Background. The purpose of NAVDOCKS P-99 is to improve the entire spectrum of public works management. This includes maintenance, utilities and transportation management functions. Since we are only concerned with a part of the maintenance function this review will cover only appropriate portions of the manual. Similar to NAVDOCKS P-321, NAVDOCKS P-99 was published primarily for use by public works departments. Only certain portions of the reporting procedures covered in the manual are used at PWCs. Particular emphasis is placed on the planning and control functions of management in NAVDOCKS P-99. This emphasis is reflected in the new reporting requirements.

The Budget as a Plan. It is the aim of NAVFAC to use the budget as the basis for planning within the public works area.[1] Although specific budget procedures are reviewed later, a discussion of the budget as a plan is appropriate here. There is a direct relationship between the budget and the reporting requirements of NAVDOCKS P-99. In our discussion of the methodology of controlled maintenance, emphasis was placed on inspection. Inspection is (or should be) the primary source of work input for the variable workload of a public works organization. The inspection records then form a quantitative basis for the budget.

How does the budget become a plan? The quantitative data from the inspection records is converted to dollar costs in the budget process. These costs are added to other planned costs for work generated by sources other than inspection, costs of recurring work and other fixed costs. The total costs resulting make up the budget. This budget is forwarded to the Field Office of the NAVFAC for approval. Once a budget is approved and funds are provided it must be revised to reflect the amount of the annual funds granted. Because of fund restrictions budgets are almost always revised downward. After revision the budget becomes the working plan. It should be noted that the working plan of a NIF PWC consists of the adjusted maintenance budgets of all the customer activities.

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[1] United States Navy Department, Bureau of Yards and Docks, Public Works Management Improvements (NAVDOCKS P-99, Washington, D.C., 1064), p. 1-3.

Reports. Although several reports are required by NAVDOCKS P-99 only three of these appear to have specific application at a NIF PWC. These reports are:

1. Manpower Availability Summary. This report summarizes the manpower available for various types of work by trade classification. The summary is used to compute a balance of manpower available to accomplish the variable work load. This balance is used to prepare the Shop Load Plan which is discussed below. An example of the Manpower Availability Summary is shown in Appendix D.

2. Maintenance Cost Summary. Planning figures from the approved budget are shown on this form. These planned amounts are compared with records of actual costs after the work is completed. An example of the Maintenance Cost Summary is shown in Appendix E.

3. Shop Load Plan. This report is a plan for the performance of the variable workload of a public works organization. It is a priority list for accomplishment of work. An example of the Shop Load Plan is shown in Appendix F.

The scope of the study includes relationships between these three reports and other maintenance management functions. A detailed discussion of each of these three reports is, therefore, necessary.

Manpower Availability Summary. Manpower availability information is necessary for work input control. This report is a tabulation of manpower available in each work center (shop) by labor class code. Labor class codes are assigned to the categories of work against which labor is charged. There are two major classifications, indirect and direct. Since indirect labor class codes cover unproductive time such as supervision and leave time we are not concerned with them here. Direct labor class codes consist of the following:

Code	Description
01	Service Work
02	Emergency Work
03	Preventive Maintenance Inspection
04	Standing Job Orders Unestimated
05	Standing Job Orders Estimated
06	Minor Work
07	Specific Job Orders

Codes 01 through 06 cover recurring work. We can expect about the same expenditures, both in time and money, on these functions from one year to the next. They may be considered as fixed costs. Code 07 (Specific Job Orders) comprises the variable function in the public works business.

The purpose of the _Manpower Availability Summary_ is to derive the amount of time available, by work center, for accomplishment of specific job orders. It is prepared by the Maintenance Shops Supervisor or his designee. It is his responsibility to first list the total men available in his shops. He then subtracts out the time that must be available for indirect functions and recurring or fixed work. The balance is the manpower available for specific job orders. This balance is compared with the workload generated by the Continuous Inspection Program and other input sources of specific job orders. It should be noted that the _Manpower Availability Summary_ is prepared for a specific period of time; monthly, quarterly and annually. It is, thus, possible to plan for workload accomplishment over a period of time.

Maintenance Cost Summary. This summary is a basic control report. It should be noted that the line numbers in the report correspond with the budget line item numbers in the maintenance budget. The adjusted amounts that make up the APF in the maintenance budget are used as the planned figures (in dollars) on the Maintenance Cost Summary. This figure is broken down on a monthly basis. Actual expenditures are compared with planned amounts after the work is completed. A separate plan and, therefore, a separate Maintenance Cost Summary is prepared by each NIF PWC for each of their customers. Planned and actual figures on the Maintenance Cost Summary are listed by line item.

> For example, under the general classification of buildings, line item 3 is listed as Research and Development Buildings. A listing on this line would cover all planned and actual figures for Research and Development buildings over the period of time covered by the report.

An examination of Appendix E will illustrate the line items covered. NIF PWC customers are required to report only the total planned and actual dollar amounts by line number. This means they only fill out columns nine and ten of the report. (If they have maintenance work accomplished by contract they would also fill out columns seven and eight.) The remaining columns apply to activity public works departments. The completed Maintenance Cost Summaries are used by the customer activities, the NIF PWCs, the NAVFAC and its field commands for appraisal of the facilities maintenance function at each activity. The report is a control over expenditures against budgeted or planned amounts.

Shop Load Plan. The purpose of this plan is to acquaint management (both of the PWC and customer activities), well in advance, with the jobs that can be accomplished within the limits of available manpower and money. NAVDOCKS P-99 provides for both a short range (1 month) and long range (9 months) Shop Load Plan. As shown in Appendix F, the plan is a listing by job order number of each job by priority for accomplishment. This listing shows the impact in hours of each job on each work center of the PWC. It is important that this priority listing be made responsive to the needs of the customer activities. The work must be coordinated. This is a primary function of the project management officer (sometimes called activity facilities officer). He is a Civil Engineer Corps officer charged with responsibility for coordinating the facilities functions of customer activities with the PWC. He is assisted in the preparation of the Shop Load Plan by the shop scheduler and maintenance control director (Codes 510 and 300 in Figure 2-1).

C. Handbook of Operating Procedures for Public Works Centers NAVDOCKS P-187 (also known as HOOP)

Purpose and Scope. HOOP defines basic control procedures related to the internal operation of PWCs operating under the Naval Industrial Fund. The objective is to establish a uniform method for PWC operation.

Benefits. HOOP should provide improved and more economical control through use of standard ADP techniques. Internal and external control should be improved and simplified.

Standard Systems. While the NIF Handbook for Public Works Centers[1] calls for a set way to budget and accumulate costs no standard methods and procedures for data collection were available until the publication of HOOP in 1965. Since each PWC was receiving different types and amounts of ADP and EAM support, common procedures for data collection were not possible and each PWC has developed appropriate procedures. As a result, some PWCs were not able to fully realize the potential of ADP and EAM equipment. Also, reporting among PWCs was not consistent. As I have mentioned previously, however, each NIF PWC is scheduled to install Honeywell H-200 computer systems in the near future.

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[1] United States Navy Department, Office of the Comptroller, Navy Industrial Fund Handbook for Public Works Centers: Change 8, (NAVEXOS P-1718 Washington, D.C., 12 April 1964) pp 1-2.

HOOP was published after a review by NAVFAC of the best of the procedures in effect at the various NIF PWCs. The procedures in HOOP provide a basis for more complete and common use of the new computer systems by the PWCs.

Discussion. Implementation of HOOP will be a long and difficult process. It simply takes a great deal of time to procure and fully install a computer system ready for use. HOOP contains narrative procedures and some schematic outlines of flow diagrams. Much more detailed work is required to generate specific programs. Further, the procedures in HOOP must be adapted to fit local situations. All these things take time. This problem is compounded by a shortage of trained personnel who have a knowledge both of computer systems and PWC operations.

There is also the problem of recentralization. Ever since their inception NIF PWCs have been decentralized operations. They have prided themselves in making operational decisions where the action is. But, as Gilbert Burck has written in his book The Computer Age:

> The machine's power to help U.S. managers control their operations has generated what appears to be nothing less than a pervasive recentralization or reintegration movement.[1]

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[1] Gilbert Burck and the Editors of Fortune, The Computer Age (New York: Harper and Row Incorporated, 1965) p. 102.

HOOP represents a major step toward centralization. Since the PWCs have enjoyed a degree of autonomy it seems natural that they would resist HOOP to some extent.

NAVFAC recognized that this step toward centralization would be a problem. Before HOOP was published, a meeting of representatives of each PWC and NAVFAC was held in San Diego, California, in January, 1965, to resolve some of the problems prior to official promulgation of the manual. The author was one of the representatives of PWC Newport, Rhode Island, at that meeting. It was clear that each PWC representative preferred to have the HOOP procedures compatible with his existing methods. It was also clear that each PWC was, to a degree, different from the others. They differed in size, in activities served, in types and numbers of work centers, in specific accounting methods, in climate and in management philosophy. These facts presented a dilemma, however, the decision was made to go ahead with HOOP using the best methods that could be synthesized from present techniques. It was recognized that each PWC would have to adapt HOOP to meet its needs.

Chapter III contains the author's proposal for adaption in the work input and control areas. These proposals are considered to be adaptable to any of the NIF PWCs. They also conform to the spirit and intent of HOOP. However, as noted, they only cover the work input and control areas and are not meant to resolve all the conflicts.

Work Input Control. Neither time nor the scope of this study will permit a complete review of the detailed procedures covered in HOOP. Therefore, discussion of the details of the manual will be limited to controlled maintenance procedures covered. The basic document envisioned in HOOP to facilitate controlled maintenance procedures is the Work Input Control Record. A copy of this record is shown in Appendix G. Data for these cards is taken from inspection reports and the inspection files. Data on work generated by other than inspection sources is also entered. This information is compiled into various tab reports for use in the controlled maintenance and budgeting functions.

HOOP provides formats for 14 different reports prepared from data in the work input control records. As pointed out earlier, programs for their preparation are not provided. These formats provide a very general guide for the reports which can be prepared for local use at the discretion of the local PWC commanding officer. Implementation of basic programs and local usage of computer systems will dictate the need for them.

D. Facilities Management Budget. The most recent facilities management budget call was issued by BUDOCKS NOTICE 7110 of 7 January, 1966.[1] Copies of parts of that budget request which are pertinent to this study are shown in Appendix H. This information is included since we will illustrate a simplified method for budget preparation by ADP methods in Chapter III. The most difficult part of preparing the maintenance budget is computing the cost of facilities maintenance for the current year (fiscal year beginning on 1 July after submission of the budget in April). Using non-mechanized methods to compute these figures in a meaningful manner is a laborious process at best.

The quantity columns in the maintenance budget are taken from activity plant property records. Quantities are shown for each budget line code.

Past year data for the budget is taken from the financial records of the activity. Since the NIF Handbook for PWCs[1] requires that financial data be accumulated by expenditure account this portion is relatively easy to prepare.

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[1] United States Navy Department, Chief of the Bureau of Yards and Docks Notice 7110, Facilities Management Operating Plan and Budget Estimates and Family Housing Budget Estimates for FY 1967 - FY 1968; call for, (Washington, D.C.: Navy Department, 6 January 1966).

The budget year data is prepared using as much information as is available at budget time. These figures are usually estimates which are normally prepared in advance of requirements being confirmed.

A better method will be discussed in Chapter III.

E. Manual for Inventory of Real Property. Part I NAVDOCKS P-78 and Part II NAVDOCKS P-72.

Purpose and Scope. The procedures in these publications are established to classify the real property inventory. Classification is in terms of category codes. The real property may be thought of as the fixed asset account of each activity. An examination of Appendix H will reveal that each budget line code is a summary of one or more category codes. This provides a tie between the budget and the inventory of fixed assets.

Chapter Conclusion. This chapter has summarized some of the most important functions at a NIF PWC, namely controlled maintenance, planning, work input control, budgeting and plant accounting. The procedures are by no means complete, but should give the reader an adequate understanding of the system.

[1] Navy Industrial Fund Handbook, *op. cit.*, pp. 1-14

Chapter III

A Proposed System of Maintenance Management

Introduction. Chapter I highlighted the relationship between plant accounting, inventory, controlled inspection, budgeting and work accomplishment in the Navy. Chapter II was a review of maintenance management systems and procedures now being used. Problem areas were defined. The purpose of this chapter is to propose methods for solving some of the problems.

The Maintenance Cycle. There is a definite cycle in the maintenance function which is illustrated in figure 3-1. Briefly, the cycle involves establishing an inventory, performing inspection, budget preparation and submission, funding, planning and accomplishing work and control. This 10 step cycle provides a convenient basis for explanation of the proposal. Each item in the cycle will be discussed in turn.

1. The Real Property Inventory. An inventory of facilities is required for the maintenance function. This is used as a basis for establishing an inspection schedule.

Original maintenance control procedures required a separate inventory of facilities. However, since each activity must also maintain an official inventory of real property[1] it appears that two inventories of the same facilities are required. Because of this duplication there is a trend toward using copies of activity Class II plant account records for the inspection inventory.[2] These are the official records of

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[1] United States Navy Department, Secretary of the Navy Instruction 11011.3, Plant Property Classes I and II; physical inventory of (Washington D.C.: Navy Department, 25 May 1954).

[2] For example PWC Newport, R.I., uses copies of customer activity Class II plant account records for the inspection inventory.

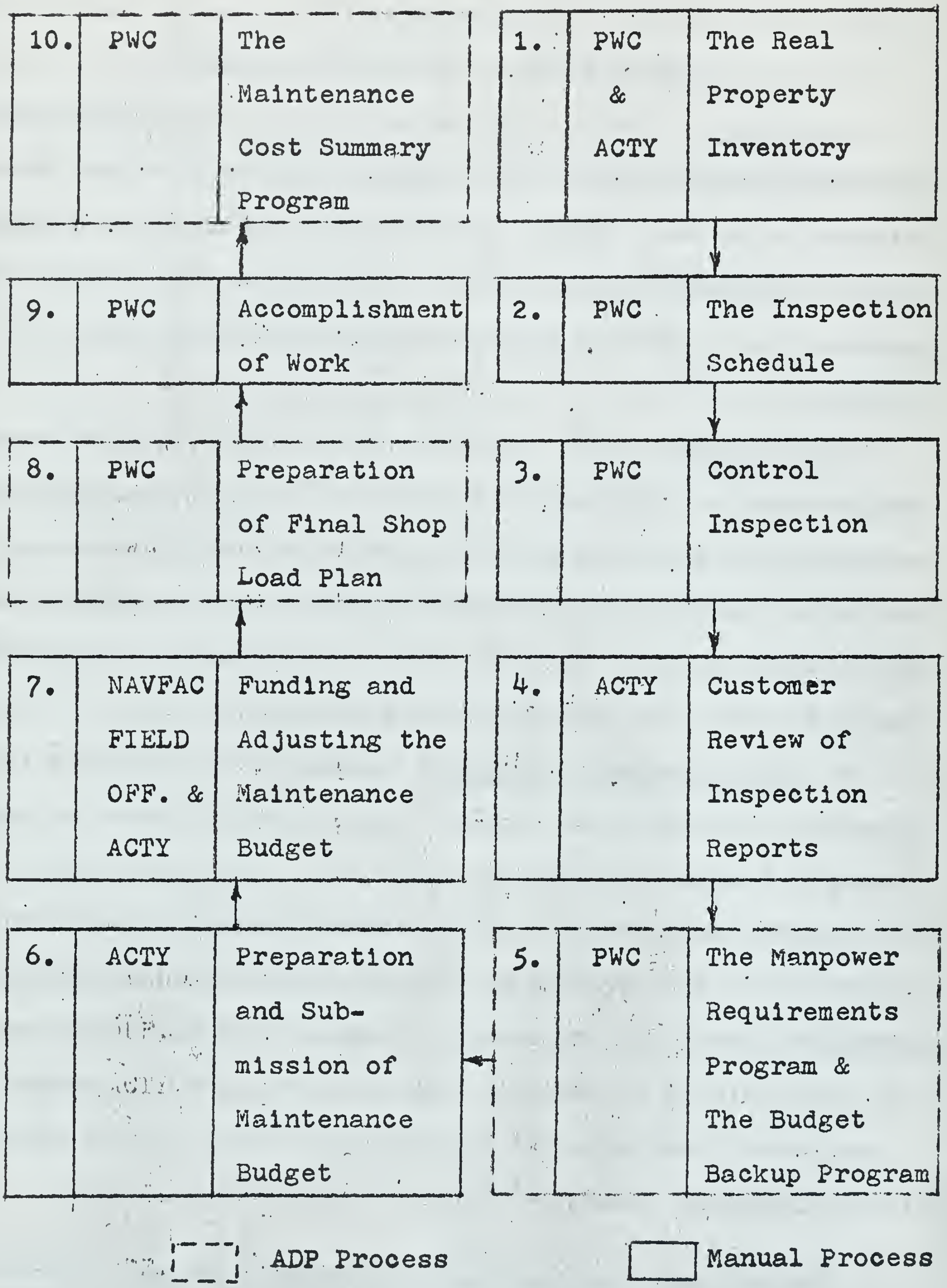
10. PWC The Maintenance Cost Summary Program
1. PWC & ACTY The Real Property Inventory
9. PWC Accomplishment of Work
2. PWC The Inspection Schedule
8. PWC Preparation of Final Shop Load Plan
3. PWC Control Inspection
7. NAVFAC FIELD OFF. & ACTY Funding and Adjusting the Maintenance Budget
4. ACTY Customer Review of Inspection Reports
6. ACTY Preparation and Sub-mission of Maintenance Budget
5. PWC The Manpower Requirements Program & The Budget Backup Program
ADP Process
Manual Process

Figure 3-1

THE MAINTENANCE CYCLE

buildings and facilities. Current budgeting instructions[1] require that quantities of each type (budget line code) of facility be shown. (e.g. square feet of barracks buildings). The quantity data on the budget should come from the official plant property records. To avoid duplication and to provide continuity in budget preparation it is recommended that duplicate copies of the Class II plant account inventory be used for the inspection inventory.

Appendix I shows a sample Class II plant account card. It is recommended that each PWC procure copies of these records from each customer activity. They should be filed by activity and by budget line code.

2. The Inspection Schedule. The control inspections are made in accordance with a schedule which is based on the inventory. The Inspection Division of the Maintenance Control Department (Code 330 on figure 2-1) is responsible for inspection. Frequency of inspection is a function of inspector availability. However, inspections should be made of every facility at least once a year to insure minimum coverage. Some types of facilities such as refrigeration plants should be inspected more frequently. It is important that deficiencies be noted and estimates for their correction be made in time for inclusion in the annual budget.[2]

3. Control Inspection. Accuracy of inspection is of paramount importance. The inspector must be skilled in the detection of deficiencies and in estimating the cost of their correction. The inspector should, therefore, be a combination planner - estimator and inspector.

---

[1] Facilities Management Operating Plan and Budget loc.cit.

[2] Frequently inspectors uncover deficiencies which must be corrected immediately. This interrupts the current Shop Load Plan and is a major reason for not scheduling all available manpower on that plan.

There are actual Navy Civil Service ratings for this combination[1] in the structural, mechanical, electrical and public works (general) fields.

Most public works activities still use both planner - estimators and inspectors. This results in duplicate field checks. The inspector visits the site to determine the deficiency and the planner - estimator must return to determine the cost of correction. This duplication strengthens the argument for using the combination ratings at PWCs. Reference to inspectors from this point will infer the use of the combination ratings.

After an inspection the report form (Appendix B) is completed. Since the estimates from these reports are to be used for budgetary purposes it is essential that detailed and accurate estimates be made. Therefore, item six on the form should be an accurate figure rather than the rough estimate specified in that space. HOOP specifies an inspection report number[2] but no space is reserved for such a number on the report form. It is recommended that a serial number be inserted at the top of each inspection report. This will facilitate the ADP procedures.

ADP Procedures. Inspection reports are the initial (and primary) input source for maintenance planning systems. This study proposes the use of specific ADP procedures for planning and control purposes. It is, therefore, appropriate to interrupt our discussion of the maintenance cycle at this point to present a general outline of the ADP proposals as shown in figure 3-2.

As we proceed through the remaining steps of the maintenance cycle it will be convenient to explain specific ADP steps. Narrative discussions of these follow in appropriate sequence. Flow diagrams, computer

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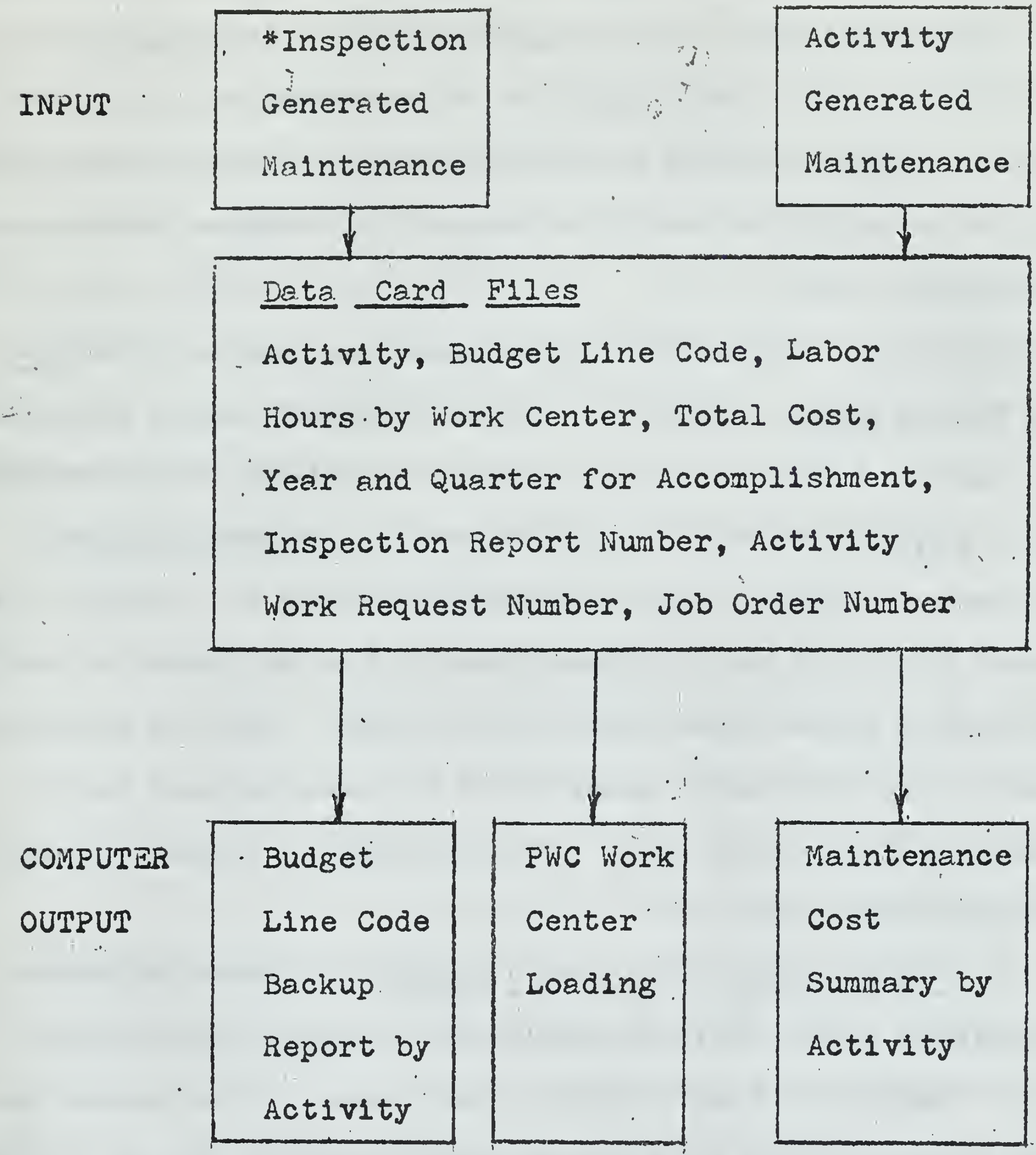
[1] PWC Newport, R.I., utilizes the combination ratings. These employees receive the pay of a planner - estimator.

[2] HOOP, op. cit. p. 3 - 11.


INPUT
*Inspection Generated Maintenance
Activity Generated Maintenance
Data Card Files
Activity, Budget Line Code, Labor Hours by Work Center, Total Cost, Year and Quarter for Accomplishment, Inspection Report Number, Activity Work Request Number, Job Order Number
COMPUTER OUTPUT
Budget Line Code Backup Report by Activity
PWC Work Center Loading
Maintenance Cost Summary by Activity

* Primary Input Source

Figure 3-2

A GRAPHIC PRESENTATION OF

ADP PROPOSALS

programs and selected computer outputs are included in the appendices.

The programs have been tested on the Control Data Corporation (CDC) 1604 computer at the U.S. Naval Postgraduate School. They were written in FORTRAN 60 (a CDC version equivalent to IBM FORTRAN II) and involve relatively simple statements so that only changes in control cards are likely to be required to run on the Honeywell H-200 systems which are to be installed at PWCs.

Data Cards. HOOP provides for the manual preparation of the Work Input Control Record (Appendix G) from the inspection reports and inventory records. Data cards are then prepared from these. The intermediate step of preparing the record is not believed to be necessary but can easily be reinstated if there are advantages to doing so. Rather, it is proposed that data cards be prepared directly from the inspection reports and the plant account cards used in the inventory. These two documents contain all the information necessary for the system proposed herein. Preparation of data cards should follow the review of inspection reports by customer activities.

4. Customer Review of Inspection Reports. As inspection reports are completed copies should be transmitted to customer activities for review. They review these in light of their needs. If they concur that the work should be done the inspection report should be returned to the PWC preferably covered by a Work Request (Appendix C).

If the work is only to be included in the budget process funds need not be cited on the Work Request. On the other hand if the work should be done before the next budget cycle funds should be cited. This will, of course, interrupt the Shop Load Plan. Once the system is operating well these urgent work requests should occur infrequently.

Work requests for activity generated maintenance work should also be forwarded to the PWC as the occasion occurs.

Preparation of Data Cards. Data cards are prepared when the inspection reports (and work requests) are returned to the PWC. The Work Control Division of the Maintenance Control Department (Code 310 on figure 2-1) should be responsible for this function. This division should have a keypunch machine for card preparation. Two basic data cards need to be prepared for each job. One is used in computing manpower requirements and the other in computing budget and control data. Figure 3-3 is an illustration of each.

Manpower Data Card. Card columns are utilized as follows:

1-5	Inspection report serial number. Any 5 digit number can be used.
6-8	Year and quarter for accomplishment. For example, 674 would mean 4th quarter of fiscal 1967.
9-15	Estimated cost. A total estimate of 9,999,999 dollars can be accommodated. Cents are dropped.
16-25	Job order number. (This number is used for financial purposes. Costs of labor, material and overhead are recorded against the number.) This accommodates the standard 10 digit number.
26-27	Activity Code. Each customer is assigned a two digit code. Any codes from 0 to 99 may be used.
	Manhours for: (Please see note below.)
28-31	Carpenter Shop
32-35	Paint Shop
36-39	Wharf Builders

40-43	Riggers
44-47	Pipe and Plumbing Shop
48-51	Welding and Sheetmetal Shop
52-55	Machine Shop
56-59	Electrical and Refrigeration Shop
60-63	Janitorial
64-67	Laborers
68-71	Trash and Garbage Shop
72-75	Emergency Service Shop

Note: For ease of illustration decimal points were included for the man hours by work center on the sample data cards shown in figure 3-3. However, if a format of F3.0 were used (this would accommodate a maximum of 999 hours per job per work center) an additional 4 work centers could be added. This addition plus the blank space shown would mean a total of 17 work centers could be accommodated using the illustrated type of data card.

An alternative method of showing man hours by work center could be used. This would require revision of the manpower requirements program which follows. Work centers could be identified by 2 digit code numbers.

> For example suppose the carpenter shop was assigned the code 01 and the pipe and plumbing shop the code 05. Assume that 100 hours for the carpenter shop and 050 hours for the pipe and plumbing shop are required. The data card could show this by the following:
>
> 0110005050

Budget Backup and Maintenance Cost Summary Data Card. Card columns are utilized as follows:

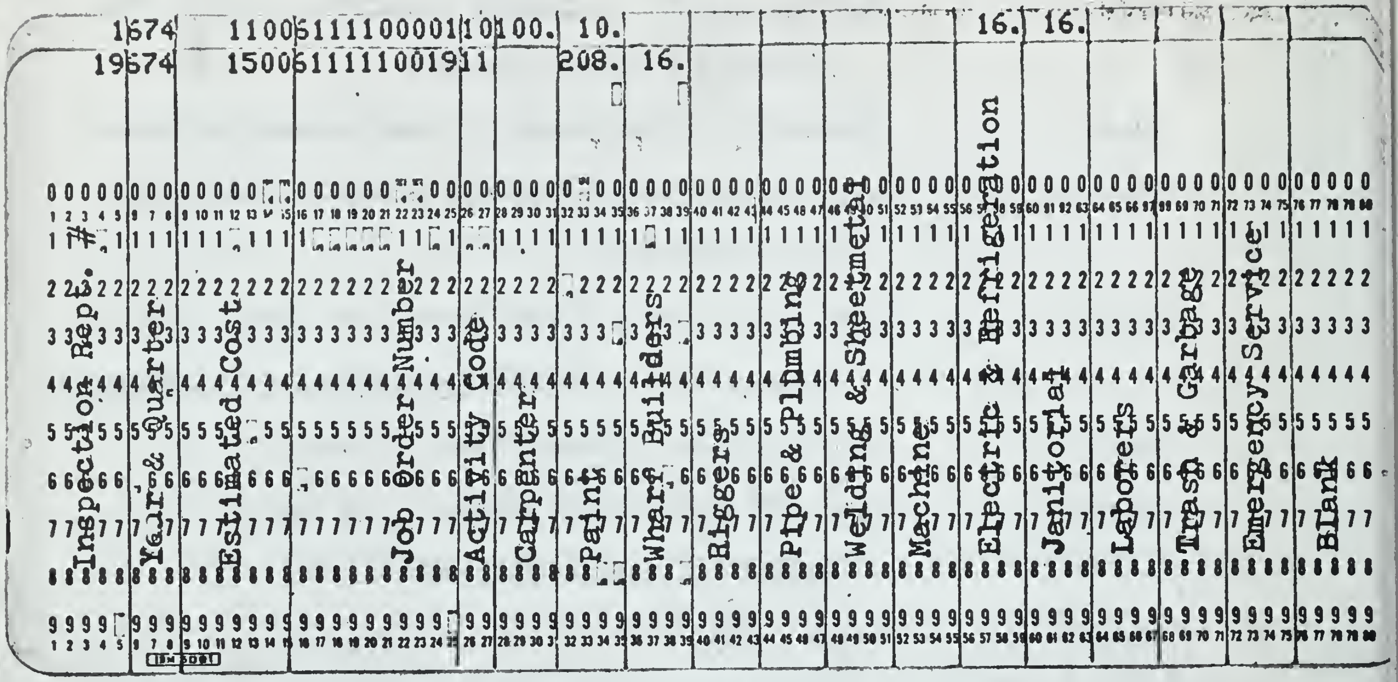
1-4	Budget line code. Allows use of standard 4 digit code.

5-9	Estimated cost. A maximum estimate of 99,999 can be used. Cents are dropped.
10-14	Inspection report number. (Same comment as above.)
15-17	Year and quarter for accomplishment. (Same comment as above.)
18-27	Job order number. (Same comment as above. Will be useful in preparing *Maintenance Cost Summary*.)
28-29	Activity code. (Same comment as above.)
30-39	Activity work request number. Any number of 10 digits or less may be used.
40-44	Actual cost. This figure is only available upon completion of the work. The existing data card is merely updated to show actual cost upon receipt of completed job order. Columns 40 through 44 are only used for preparation of the *Maintenance Cost Summary*. A maximum actual cost of 99,999 dollars can be accommodated. Cents are dropped.

5. *The Manpower Requirements Program*. It is essential that the relationship between manpower availability and workload be known. The manpower requirements program is used to determine this. The data cards are separated, on a sorter, by year and quarter. They are then processed for each quarter by the computer. The program simply reads in the manhour requirements for each job and prints out the total manpower requirement for each shop or work center. Thus, it is possible to compare requirements with availability by checking the computer output against the quarterly *Manpower Availability Summary* (Appendix D).

Appendix J shows a copy of the program as well as a flow diagram and

Manpower Requirements Data Cards


1674 1100 511110000110 100. 10. 16. 16.
19674 1500 511111001911 208. 16.
Inspection Rept. #
Year & Quarter
Estimated Cost
Job Order Number
Activity Code
Carpenter
Paint
Wharf Builders
Riggers
Pipe & Plumbing
Welding & Sheetmetal
Machine
Electric & Refrigeration
Janitorial
Laborers
Trash & Garbage
Emergency Service
Blank
IBM 5081

Budget Backup and Maintenance

Cost Summary Data Cards

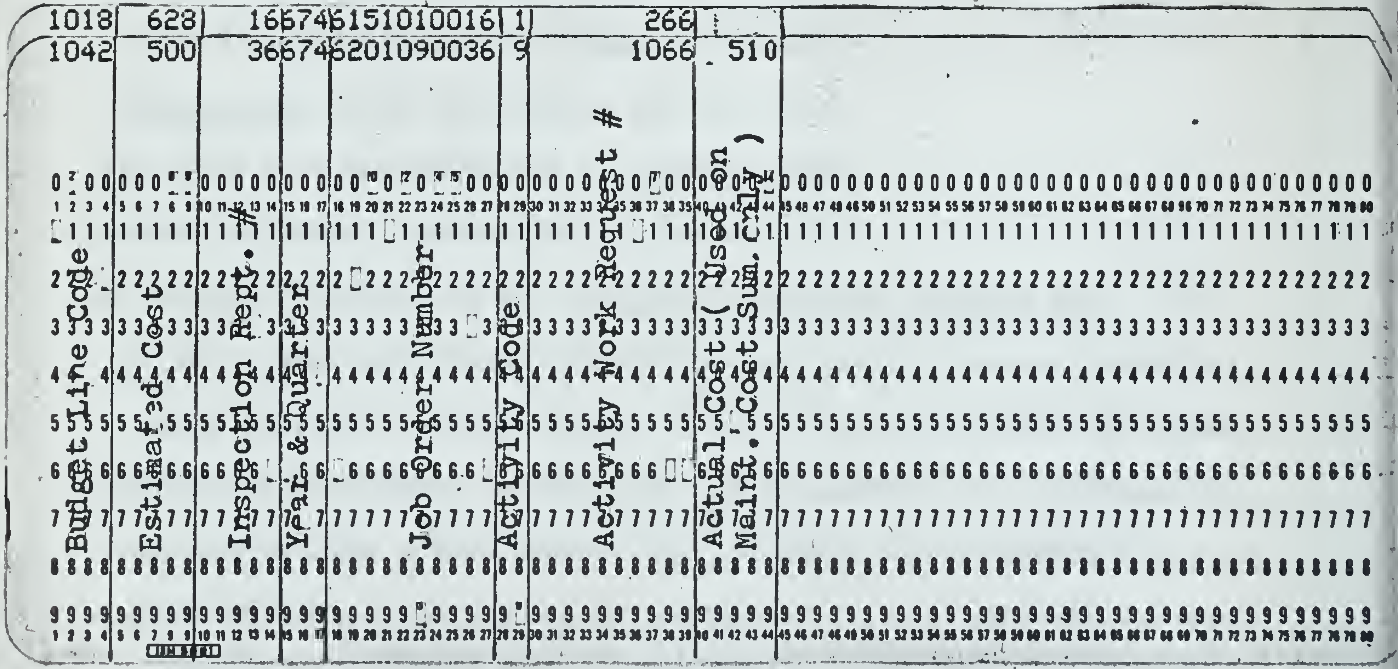

1018 628 16674 5151010016 1 266
1042 500 36674 5201090036 9 1066 510
Budget Line Code
Estimated Cost
Inspection Rept. #
Year & Quarter
Job Order Number
Activity Code
Activity Work Request #
Actual Cost (Used on Maint. Cost Sum. Only)
IBM 5081

Figure 3-3

SAMBLE DATA CARDS

a sample of the computer output. Note that this output includes data on each job in addition to the total manhour requirements. If the workload is too heavy or light in a particular quarter for any given shop it is possible to review the printout and move appropriate jobs to another quarter to balance the load. Replacement data cards are required to reflect changes made in year and quarter for accomplishment.

Budget Line Code Backup Program. After manpower requirements have been matched with manpower availability appropriate budget backup data cards are replaced to match changes which were made (see preceding paragraph) in the manpower data cards. New data cards will be required for shifts since year and quarter for accomplishment will change. The budget backup data cards are sorted by year and by activity. The program is only run using current year (year beginning following July) cards. Separate runs are required for projected (beyond the current year) budget backup. Since it submits a separate maintenance budget the program is run once for each activity. The purpose is to summarize planned expenditures by budget line code.

Appendix K shows a copy of the program as well as a flow diagram and a sample of the computer output. Note that the output includes data on each job as well as a summary of the budget backup amounts in the exact budget format.

The output is then forwarded to the customer activity for use in budget preparation.

6. Preparation and Submission of Maintenance Budget. Upon receipt of the computer output, customer activities have the necessary data to prepare the maintenance budget. It must be remembered that the computer output only covers the variable portion of the budget. The fixed portion (indirect and recurring labor class codes) can be taken from the

financial records of the activity. In other words, the activity comptroller should be able to furnish a tabulation of fixed work by expenditure account. This tabulation should be adjusted to show any planned changes. The dollar amounts for each expenditure account are then summarized by budget line code. See Appendix H for conversion tables. These fixed amounts are then added to the amounts shown on the computer output. The result is the budget amount for the current year.

The maintenance budget is then sent to the appropriate Field Office of the NAVFAC for funding action.

7. Funding and Adjusting the Maintenance Budget. The Field Office normally finds it necessary to adjust activity budgets downward due to an excess of demand over the funds available. After adjustments, an annual planning figure (APF) is provided to each activity. When the activity receives this they adjust their earlier budget accordingly by shifting the least required jobs to future year plans. The PWC is notified of each job shifted and adjusts data cards accordingly.

8. Preparation of Final Shop Load Plan. A final run is made using the manpower requirements program discussed above. The printout from this program is again compared with manpower availability and final adjustments are made. The PWC then prepares a list of all jobs for the year by quarter. The top portion of the printout contains a convenient list of each job to be included. This list becomes the Shop Load Plan.

9. Accomplishment of Work. The next phase of the cycle consists of work accomplishment by PWC forces. The Shop Load Plan is sent to the maintenance scheduler (Code 510 on figure 2-1) as the basis for the weekly maintenance schedule. He should be able to plan this in an orderly manner since the manpower requirements on the Shop Load Plan should

equal the manpower available to do the work. As the work is completed the final cost of each job is recorded on the budget backup and maintenance cost summary data cards. (Up to this point only budget backup data was included on the cards.) It is a simple matter for the keypunch operator of the Work Control Division to pull the budget backup data cards and punch in the final cost as completed job orders are reported.

10. The Maintenance Cost Summary Program. Files are maintained by the Work Control Division of data cards which have been punched with final cost data. Monthly (or at any interval desired) these data cards are processed.

In order that the Maintenance Cost Summary may be complete, data cards should also be prepared for recurring work. (Labor Class Codes 01 through 06.) The keypunch operator should punch cards for each completed recurring job order. All data necessary is available from the completed job order reports except inspection report numbers and the year and quarter for accomplishment. These items are not essential on the Maintenance Cost Summary. The keypunch operator has only to punch the following on new data cards for recurring work:

Columns	
1-4	Budget Line Code
5-9	Estimated Cost
18-27	Job Order Number
28-29	Activity Code
30-39	Activity Work Request Number
40-44	Actual Cost

The completed recurring work cards and the specific job order cards are combined and sorted by activity code. This makes it possible to run the program at such frequency as any of the customer activities may desire. The program is the same as the budget backup program except for the inclusion of actual costs. The printout includes both estimated and actual costs. Appendix L shows a copy of the program and a sample of the computer output. Flow diagrams for this program are not given since it so closely resembles the budget backup program. The printout is in the exact format required on the _Maintenance Cost Summary_ for activities served by a NIF PWC.

This completes the maintenance cycle.

Chapter Conclusion. A proposed method for improving the work input and control phases of the maintenance cycle through the use of three computer programs has been illustrated. Each of these may require minor parameter adjustments prior to implementation at a given PWC.

The topic of unlike numbers of work centers in each PWC was included in the discussion on preparation of data cards. Although there is no known standard numbering system for inspection report numbers, activity codes and activity work request numbers, sufficient columns have been allowed on the data cards to accommodate any of the existing systems. All other data for the proposed programs is now standard for all PWCs.

Only basic ADP applications in the work input and control areas have been covered. As the study progressed the possibility of further applications at NIF PWCs became increasingly more evident. Chapter IV will discuss some of these.

Chapter IV

Conclusions and Recommendations

Conclusion. The advent of automatic data processing has great potential for maintenance management. The NAVFAC has recognized many possible uses of ADP at Navy PWCs. This was clearly demonstrated when HOOP was published and when computers were ordered for the NIF PWCs. Both HOOP and the computer systems will be valuable tools for improvement of the maintenance management function.

This study has included proposals for accomplishment of the work input and control phases of the maintenance cycle. The approach is intended to be reasonable and basic. Any NIF PWC should be able to use the proposed programs after making the adjustments discussed in the conclusion to Chapter III.

Benefits. The following is a discussion of the contributions to better management through use of the proposed programs.

1. Manpower Requirements Program. Although the Shop Load Plan prescribed by NAVDOCKS P-99 provides a means for deriving the manpower available for specific job orders there was no known previous means to provide a list of manhour requirements. This program provides such a list. Long range planning of manpower requirements will be possible through its use.

2. Budget Line Code Backup Program. This program provides an automated means for compilation of the variable portion of the maintenance budget. In previous public works assignments at PWC, Newport, and NSC, Pearl Harbor, the author has found the preparation of this portion of the budget by hand methods to be a very laborious process. The result has sometimes been too much reliance on what was done in the past and not

enough on what really needs to be done. Use of the budget line code backup program will provide a budget which clearly and accurately represents what needs to be done. Such a budget can be justified in terms of actual requirements.

3. Maintenance Cost Summary Program. Use of this program will result in the automatic printout of the required report. At present, PWCs without computer capability must depend on outside support for preparation of the Maintenance Cost Summary. The author was unable to find a standard means used by outside support activities for computer preparation of the report. It was determined that detailed review of actual expenditure data provided by the outside activities was required prior to preparation of the report. Often expenditure data bore no resemblance to planned figures. The result, in many cases, was late and inaccurate reports. Use of the maintenance cost summary program by PWCs, when computers are available, will not only provide a timely report but also a valuable control device.

Recommendations. The need for more ADP systems at PWCs became increasingly more evident as the study progressed. It is recommended that further application studies be conducted by persons with actual NIF PWC experience who have a basic understanding of the potential of ADP systems.

A review should be made of HOOP leading to specific programs applicable to all PWCs. The following is a list which could be developed.

	Pages in HOOP	Program to be Developed
1.	3-33 to 3-37A	Minor Work Procedures
2.	3-38 to 3-43	Emergency Service Procedures
3.	3-44 to 3-45	Weekly Status Report

	Pages in HOOP	Program to be Developed
4.	3-46 to 3-47	Monthly Transaction Report
5.	3-48 to 3-49	Quarterly Report of Unfunded Facility Inspection Deficiencies
6.	3-50 to 3-51	Semi-Annual Facilities Project Summary
7.	3-52 to 3-55	Annual Inspection Summary
8.	3-58 to 3-59	Maintenance and Repair Projects Planned for Accomplishment During the Ensuing Fiscal Year
9.	3-60 to 3-61	Projects not Planned for Accomplishment but for Which Plans and Specifications are Planned for Completion During Ensuing Fiscal Year
10.	3-64 to 3-65	Planning Group Backlog
11.	3-68 to 3-69	Customer Status Report
12.	3-70 to 3-71	Jobs Cancelled, Closed or Completed

Since the author is most familiar with the controlled maintenance function the programs recommended for consideration have been limited to that area. However, certain additional general observations are considered appropriate.

1. HOOP contains no section for the Engineering Department. (Code 200 on figure 2-1). The use of ADP would be appropriate for such things as repetitive calculations, data storage and retrieval, cost estimating and workload planning.

2. Chapter 7 in HOOP provides some excellent reports for the Housing Department (Code 400 on figure 2-1) but they must be prepared by manual

means. It is suggested that computer applications be investigated.

3. It is apparent that the 12 pages devoted to the Utilities Department (code 600 on figure 2-1) in HOOP should be expanded upon. Computer programs are needed. Because of the similarity of the Utilities Department to a public utility company it is believed worthwhile to investigate existing commercial systems, e.g., Minneapolis Honeywell has produced a pamphlet[1] which would be helpful. Other commercial business systems such as Westinghouse "Powercasting" for simulating alternative expansion strategies of utility functions would be useful.[2] Estimates of cost savings to electric utilities through use of this system range as high as 6 billion dollars over the next 20 years.

4. HOOP only devotes 3 pages to the Maintenance Department. (Code 500 on figure 2-1). Obviously this section in HOOP has not been completed. The potential for ADP in the Maintenance Department is vast. Again commercial ADP applications should be investigated. This could go as far as the adoption of "On Line" in "Real Time" methods such as those used by Westinghouse and Lockheed.[3]

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[1] Minneapolis Honeywell Corporation, Application Survey for Public Utility Customer Accounting, (Wellesley Hills, Massachusetts, 1965).

[2] L.R. Hague, (Director Westinghouse Business Systems), Unpublished Report on Business Systems at Westinghouse, October 1964.

[3] The Computer Age, op. cit., pp. 26-47.

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13. Hague, L.R., Business Systems at Westinghouse. Unpublished report, 1964.

14. Minneapolis Honeywell Corporation, Application Survey for Public Utility Customer Accounting. Wellesley Hills Massachusetts, 1965.

Appendix A

Appendix B

INSPECTION REPORT NAVDOCKS 11014/1 (7-65)

☐ P.M. INSPECTION ☐ CONTROL INSPECTION

1. PROPERTY NO.

2. DESCRIPTION

3. LOCATION

4. L.M.C.

5. METH. OF ACCOMP. ☐ CONTRACT ☐ SHOP FORCES

6. ROUGH EST'D COST TO CORRECT $

7. QTR. AND FY OF RECOMMENDED ACCOMPLISHMENT

8. INSPECTOR

9. INSPECTOR TIME USED

10. MANAGER INSPECTION BRANCH

11. DATE

12 WORK PERFORMED UNDER SHOP CONTROL NO. JOB ORDER NO. CONTRACT NO.	13 DESCRIPTION OF ITEM AND CAUSE (*P.M. INSPECTORS:* ALSO LIST REPAIRS AND ADJUSTMENTS MADE)	14 MAINTENANCE	
		ESSENTIAL	PROJECTED

D-60617

Appendix C

WORK REQUEST (CONTROLLED MAINTENANCE)

NAVDOCKS 11014/2 (7-65)

PART I - REQUEST *(Filled in by Requestor)*

1. TO	2. FROM	3. FOR FURTHER INFORMATION CALL	4. REQUEST NO.

5. REQUEST FOR ☐ PRELIMINARY COST ESTIMATE ☐ RECURRING COST ESTIMATE ☐ SPECIFIC COST ESTIMATE ☐ PERFORMANCE OF WORK *(Funding document attached)*	6. FUNDING INFO. ☐ PROBABLE DEFINITE ☐	7. ESTIMATED FUNDING DATE	8. FMO/STAFF C.E. VERIFICATION

9. BUILDING NO. AND LOCATION	10. CONTROLLED MAINTENANCE INSPECTION NO. *(If any)* INSP NO.: ITEM NO./NOS.:	11. FACILITY PROJECT NO.

12. SKETCH/PLAN ATTACHED ☐ YES ☐ NO	13. DRAWING NO.	14. PROPERTY RECORD CARD NO.	15. CUSTOMER COST NO.

16. DESCRIPTION OF WORK *(Include type, size, quantity, etc.)*

TITLE *(26 digits only)*

17. ALLOTMENT CONTROL NUMBER	18. SIGNATURE *(Requesting Official)* AND DATE

PART II - (Filled out by Maintenance Control Organization)

19. TO:	21. SKETCH/PLAN ATTACHED ☐ YES ☐ NO	22. DRAWING NO.

20. COST ESTIMATE	
a. LABOR	$
b. MATERIAL	$
c. OVERHEAD AND/OR SURCHARGE	$
d. CONTINGENCY	$
e. TOTAL	$

23. BASED UPON AN ESTIMATED FUNDS ACCEPTANCE DATE OF ____________ THIS WORK CAN BE STARTED WITHIN ____________ DAYS FROM THAT DATE.

24. ☐ THIS IS A FIXED-PRICE ESTIMATE AND IS VALID ONLY IF FUNDED WITHIN 15 DAYS OF THE DATE IN ITEM 23 ABOVE.

25. FUNDING DOCUMENTS NOT ACCEPTED WITHOUT FIRM ESTIMATE. PRELIMINARY ESTIMATES NOT ACCEPTABLE FOR FUNDING.

26. SIGNATURE	27. DATE

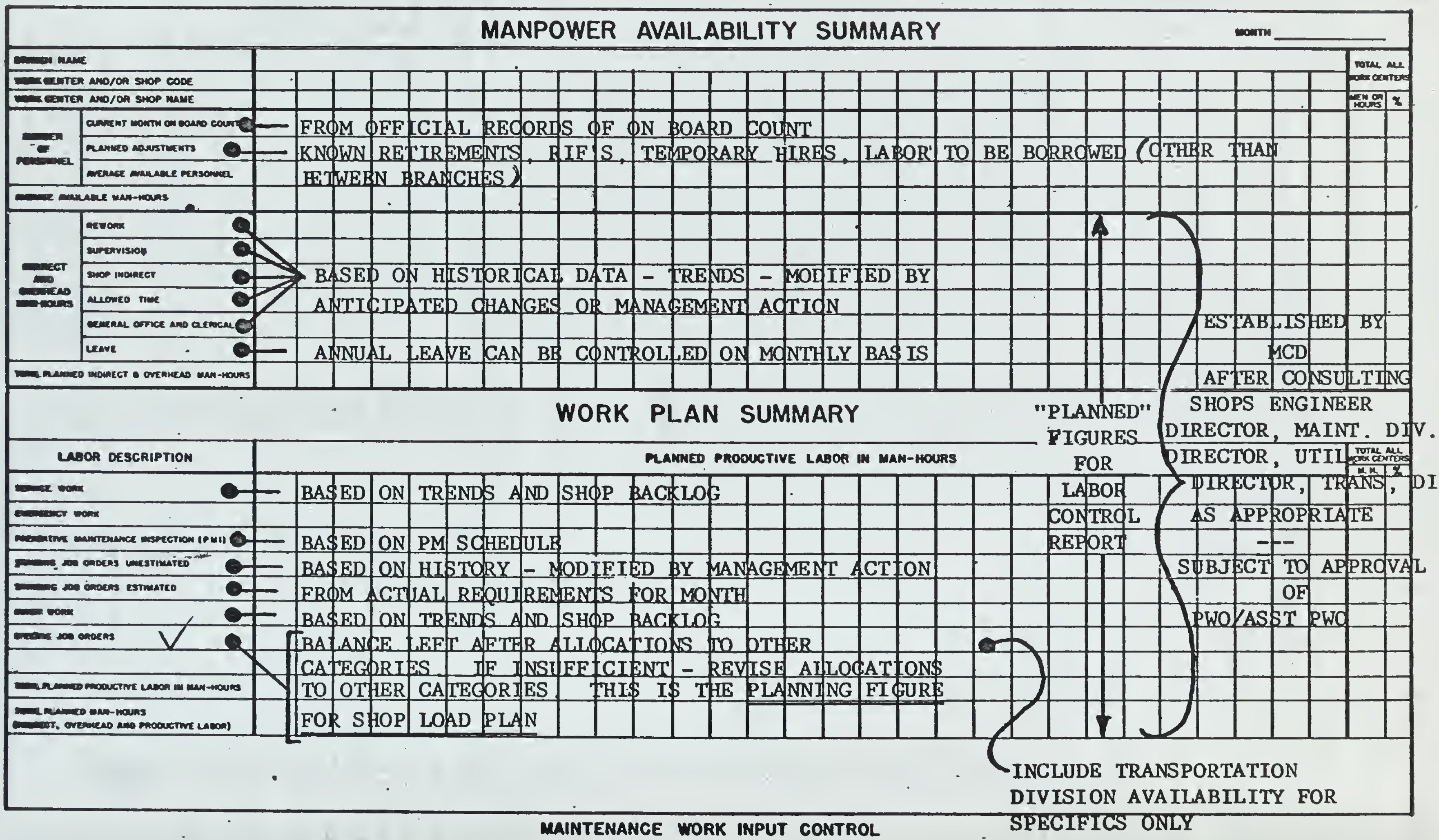
28. REMARKS

PART III - FUNDING INFORMATION

29. NUMBER OF FUNDING DOCUMENT ACCEPTED	30. JOB ORDER NO.	31. EXPIRATION DATE OF FUNDS

[illegible]

Appendix D



MANPOWER AVAILABILITY SUMMARY

MONTH ____________

BRANCH NAME

WORK CENTER AND/OR SHOP CODE

WORK CENTER AND/OR SHOP NAME

TOTAL ALL WORK CENTERS

MEN OR HOURS | %

NUMBER OF PERSONNEL

- CURRENT MONTH ON BOARD COUNT — FROM OFFICIAL RECORDS OF ON BOARD COUNT
- PLANNED ADJUSTMENTS — KNOWN RETIREMENTS, RIF'S, TEMPORARY HIRES, LABOR TO BE BORROWED (OTHER THAN BETWEEN BRANCHES)
- AVERAGE AVAILABLE PERSONNEL

AVERAGE AVAILABLE MAN-HOURS

INDIRECT AND OVERHEAD MAN-HOURS

- REWORK
- SUPERVISION
- SHOP INDIRECT
- ALLOWED TIME
- GENERAL OFFICE AND CLERICAL

— BASED ON HISTORICAL DATA - TRENDS - MODIFIED BY ANTICIPATED CHANGES OR MANAGEMENT ACTION

- LEAVE — ANNUAL LEAVE CAN BE CONTROLLED ON MONTHLY BASIS

TOTAL PLANNED INDIRECT & OVERHEAD MAN-HOURS

WORK PLAN SUMMARY

LABOR DESCRIPTION

PLANNED PRODUCTIVE LABOR IN MAN-HOURS

TOTAL ALL WORK CENTERS

M.H. | %

- SERVICE WORK — BASED ON TRENDS AND SHOP BACKLOG
- EMERGENCY WORK
- PREVENTIVE MAINTENANCE INSPECTION (PMI) — BASED ON PM SCHEDULE
- STANDING JOB ORDERS UNESTIMATED — BASED ON HISTORY - MODIFIED BY MANAGEMENT ACTION
- STANDING JOB ORDERS ESTIMATED — FROM ACTUAL REQUIREMENTS FOR MONTH
- MINOR WORK — BASED ON TRENDS AND SHOP BACKLOG
- SPECIFIC JOB ORDERS ✓ — BALANCE LEFT AFTER ALLOCATIONS TO OTHER CATEGORIES. IF INSUFFICIENT - REVISE ALLOCATIONS TO OTHER CATEGORIES. THIS IS THE PLANNING FIGURE FOR SHOP LOAD PLAN

TOTAL PLANNED PRODUCTIVE LABOR IN MAN-HOURS

TOTAL PLANNED MAN-HOURS (INDIRECT, OVERHEAD AND PRODUCTIVE LABOR)

"PLANNED" FIGURES FOR LABOR CONTROL REPORT

ESTABLISHED BY MCD AFTER CONSULTING SHOPS ENGINEER DIRECTOR, MAINT. DIV. DIRECTOR, UTIL DIRECTOR, TRANS, DIV AS APPROPRIATE

SUBJECT TO APPROVAL OF PWO/ASST PWO

INCLUDE TRANSPORTATION DIVISION AVAILABILITY FOR SPECIFICS ONLY

MAINTENANCE WORK INPUT CONTROL

Figure 4

MANPOWER AVAILABILITY SUMMARY AND WORK PLAN SUMMARY

Appendix E

MAINTENANCE COST SUMMARY
NAVCOMPT

DATE:

ACTIVITY NAME & LOCATION	ACTIVITY SNDL NO.	ACT. ACCT. NO.	ACT.ACCT.NO. (Holder of Plant Acct. If different)	APPN.SYMBOL & SUBHEAD	BUREAU ALLOT.NO.	NAV. DIST.	MGMT. BUR.

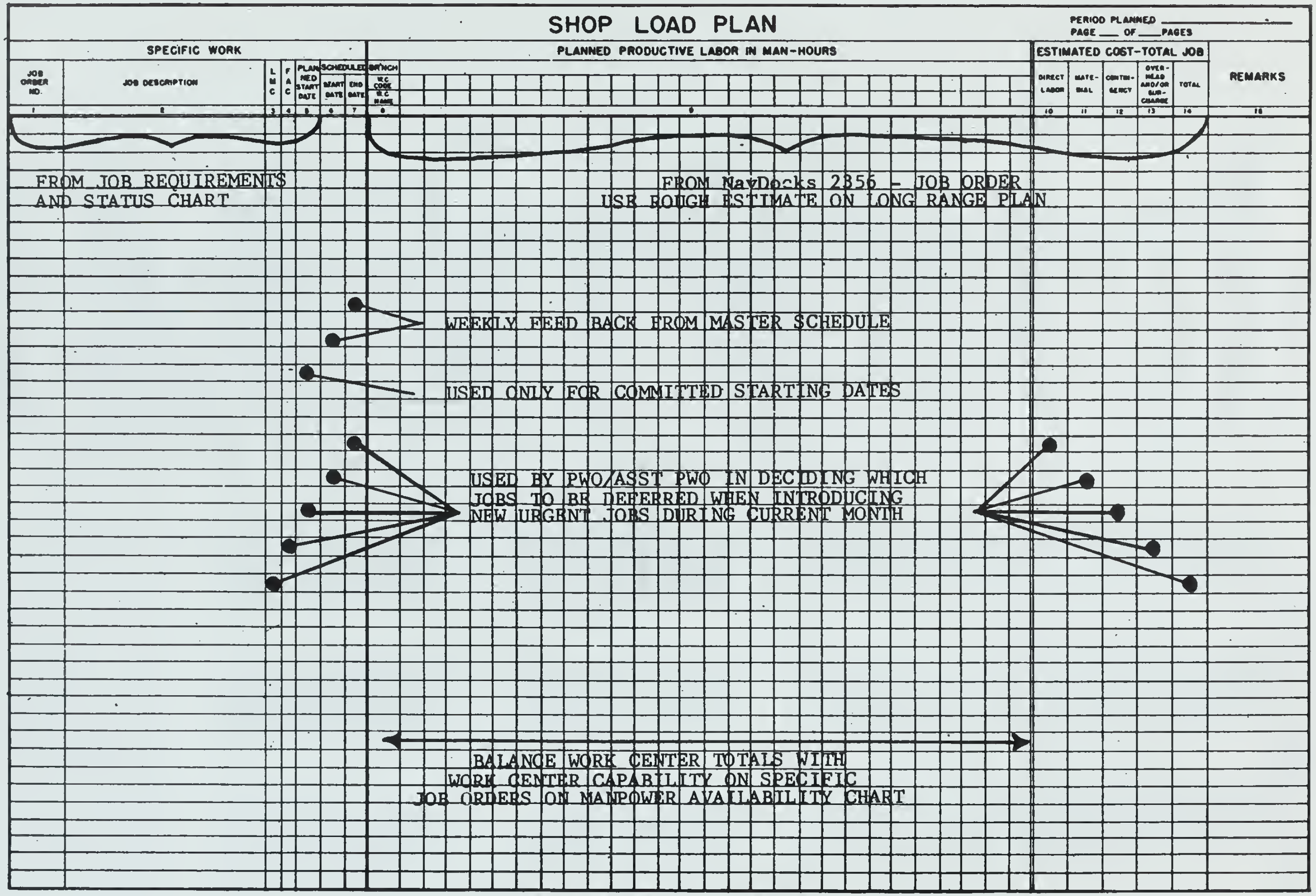
Line No. (1)	CATEGORIES OF WORK (2)	TOTALS TO DATE							
		LABOR		MATERIAL & OTHER		CONTRACT		TOTAL	
		Plan (3)	Actual (4)	Plan (5)	Actual (6)	Plan (7)	Actual (8)	Plan (9)	Actual (10)
	DIRECT MAINTENANCE - REPAIR OF REAL PROPERTY(Other than Utilities)	▨		▨		▨			
	BUILDINGS	▨		▨		▨			
1	Training	▨		▨		▨			
2	Maintenance and Production	▨		▨		▨			
3	Research and Development	▨		▨		▨			
4	Storage	▨		▨		▨			
5	Medical	▨		▨		▨			
6	Administration	▨		▨		▨			
7	Family Housing	▨		▨		▨			
8	Troop Housing	▨		▨		▨			
9	Community	▨		▨		▨			
10	Other	▨		▨		▨			
11	TOTAL OF LINES 1 thru 10								
	WATERFRONT	▨		▨		▨			
12	Wharves and Piers	▨		▨		▨			
13	Seawalls, etc.	▨		▨		▨			
14	Other	▨		▨		▨			
15	TOTAL OF LINES 12 thru 14								
	SURFACED AREAS	▨		▨		▨			
16	Roads and Streets	▨		▨		▨			
17	Airfield Pavements	▨		▨		▨			
18	Other	▨		▨		▨			
19	TOTAL OF LINES 16 thru 18								
	GROUNDS	▨		▨		▨			
20	Improved	▨		▨		▨			
21	Other	▨		▨		▨			
22	TOTAL OF LINES 20 and 21								
23	OTHER STRUCTURES (Family Housing)								
24	OTHER STRUCTURES AND FACILITIES								
25	TOTAL-MAINTENANCE AND REPAIR (Other than Utilities)								
	DIRECT MAINTENANCE AND REPAIR OF REAL PROPERTY (Utilities)	▨		▨		▨			
	UTILITY PLANTS	▨		▨		▨			
26	Electrical	▨		▨		▨			
27	Steam and Hot Water	▨		▨		▨			
28	Water	▨		▨		▨			
29	Sewage	▨		▨		▨			
30	TOTAL OF LINES 26 thru 29								
	UTILITIES DISTRIBUTION SYSTEMS	▨		▨		▨			
31	Electrical	▨		▨		▨			
32	Steam and Hot Water	▨		▨		▨			
33	Water	▨		▨		▨			
34	Sewage	▨		▨		▨			
35	TOTAL OF LINES 31 thru 34								
36	OTHER UTILITY MAINTENANCE								
37	TOTAL MAINTENANCE AND REPAIR (Utilities								
	OTHER MAINTENANCE AND REPAIR	▨		▨		▨			
38	Minor Construction & Alterations	▨		▨		▨			
39	E/S Work Real Property	▨		▨		▨			
40	E/S Work Mon-Real Property	▨		▨		▨			
41	Other Maintenance	▨		▨		▨			
42	Maint. & Repair Class III Property	▨		▨		▨			
43	Janitorial	▨		▨		▨			
44	Insect and Rodent Control	▨		▨		▨			
45	All Other (Except Non-Navy Reimb.)	▨		▨		▨			
46	TOTAL-OTHER MAINT. & REPAIR								
	INDIRECT MAINTENANCE AND REPAIR	▨		▨		▨			
47	Maintenance Shop Overhead	▨		▨		▨			
48	Service Shop Overhead	▨		▨		▨			
49	TOTAL-INDIRECT MAINT. & REPAIR								
50	TOTAL MAINTENANCE DIVISION (Total of Lines 25, 37, 46, and 49) (Less Non-Navy Reimbursables)								
51	NON-NAVY REIMBURSABLES								
52	TOTAL MAINTENANCE DIVISION								
53	MAINTENANCE CONTROL DIVISION								

SUBSIDIARY SUMMARY APPLICATION TO FACILITIES MAINTENANCE (RECURRING) SUB-HEAD .2505

Lines 11 less line 7 plus lines 15, 19, 22, 24, 37, 39, 47 and 53 = B.P. 10
Line 7, line 23 (Not applicable)
Line 38 = MINOR CONSTRUCTION B.P. 12
Lines 40-41 and 48 = B.P. 18 COSTS
Lines 42-45* = PHASE II COSTS B.P. 22

* Portion,on overall Summary under BuDocks Funding.

Appendix F


SHOP LOAD PLAN
PERIOD PLANNED ____
PAGE ___ OF ___ PAGES
SPECIFIC WORK
JOB ORDER NO.
JOB DESCRIPTION
L M C
F A C
PLANNED START DATE
SCHEDULED
START DATE
END DATE
BRANCH
W.C. CODE
W.C. NAME
PLANNED PRODUCTIVE LABOR IN MAN-HOURS
ESTIMATED COST-TOTAL JOB
DIRECT LABOR
MATERIAL
CONTINGENCY
OVERHEAD AND/OR SURCHARGE
TOTAL
REMARKS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
FROM JOB REQUIREMENTS
AND STATUS CHART
FROM NavDocks 2356 - JOB ORDER
USE ROUGH ESTIMATE ON LONG RANGE PLAN
WEEKLY FEED BACK FROM MASTER SCHEDULE
USED ONLY FOR COMMITTED STARTING DATES
USED BY PWO/ASST PWO IN DECIDING WHICH
JOBS TO BE DEFERRED WHEN INTRODUCING
NEW URGENT JOBS DURING CURRENT MONTH
BALANCE WORK CENTER TOTALS WITH
WORK CENTER CAPABILITY ON SPECIFIC
JOB ORDERS ON MANPOWER AVAILABILITY CHART

MAINTENANCE WORK INPUT CONTROL

Figure 5

SHORT AND LONG-RANGE SHOP LOAD PLAN CHART

Appendix G

1. DESCRIPTION (*Include Structure Number*)							
2. INSPECTION NO.	3. ITEM	4. DATE OF INSP.	5. INSP'D BY 1 | 2 | 3 | 4 | 5	6. DEFICIENCY CODE 1 | 2 | 3 | 4 | 5 | 6 | 7	7. DEF. TYPE 1 | 2 | 3 | 4 | 5	6. ESTIMATE ($)	9. LMC

10. REQUEST NO. (*Activity*)	11. TYPE REQUEST PE | RE | SE | PW	12. PROB. FUND. DATE	13. PROP. REC. CARD NO.	14. FUNC. ACT.	15. PRIOR

16. JOB ORDER NO.	17. APPROPRIATION	(*Fund Code*)	16. SUB-HEAD	19. B.P.	20. BUDG. L.I.	21. U/M	22. QUANTITY

23. FACILITY PROJECT NO.	24. TYPE OF PROJECT M | R | FP | MC | EI | AC | FH	25. CAT. CODE	26. THIS INCREMENT $	27. REMAINDER $

26. FUNDED COST	29. PROJECT COST	DESIGN			
		30. METHOD C | S | B | F | E | A | Z	31. COST ($100)	32. EST. COMP. DATE	33. ACT. COMP. DATE
$	$				

34. ENGINEERING (*Type*) A | E | M | C | S | O	35. EST. MH	36. ACT. MH	37. EST'D START	36. ACT. START	39. EST'D COMPL.	40. ACT. COMP.
41. PLAN. & EST. (*Type*) S | E | M | G | W | R	42. EST. MH	43. ACT. MH	44. EST'D START	45. ACT. START	46. EST'D COMPL.	47. ACT. COMP.

✓ = EPS	✓	46. W.C.	✓	49. W.C.	✓	50. W.C.	✓	51. W.C.	✓	52. W.C.	✓	53. W.C.	✓	54. W.C.	✓	55. W.C.	56. TOTALS
SHOPLOAD ESTIMATES																	
ESTIMATED MAN-HOURS																	
ESTIMATED MATERIALS $'s																	

73. REMARKS

57. MAC C | S | M | P	71. QTR. & FY PLAN. ACCOMP.
56. EST. PREPARED E | P | FP | NF | R	
STATUS DATES ↓	72. STAT. CODE
59. EST. TO CUST.	0
60. REQUEST REC'D	1
61. FUNDS REC'D	2
62. PROG. MONTH	3
63. TO MATER. DEPT.	4
64. TO MAINT. DEPT.	5
65. MATERIAL DUE	6
66. MATERIAL REC'D	7
67. PLANNED START	8
66. SCHED. DATE	9
69. COMPL. DATE	10
70. CLOSED/CANCEL.	11

PUBLIC WORKS MAINTENANCE INPUT CONTROL RECORD - NAVDOCKS 11014/3 (7-65)

D-43410

Appendix H

NAVDOCKS 7110/5 SHEET 1 OF 2 (11-60)
Supersedes NAVDOCKS 2350 Sheet 1

ANNUAL BUDGET ESTIMATE FOR RECURRING MAINTENANCE OF REAL PROPERTY

REPORT BUDOCKS 7110-1

ACTIVITY NAME AND LOCATION	ACT ACCT NO	ACTIVITY CODE NO	NAV DIST	MGMT BUR	APPROPRIATION SYMBOL & SUBHEAD	ACT ACCT NO (Holder of Plant Acct IF DIFFERENT)	PAST YEAR ALLOT NO

BUDGET LINE ITEM	DESCRIPTION	UNIT OF MEASURE	PAST YEAR, FY______					CURRENT YEAR, FY______						BUDGET YEAR, FY______			
								APF		OPERATING PLAN				ACTIVITY		BFD	
										ACTIVITY'S PLAN		APPROVED PLAN					
			QUANTITY	LABOR	MATERIAL AND OTHER	CONTRACT	TOTAL COSTS	QUANTITY	TOTAL COST	QUANTITY	TOTAL COST	QUANTITY	TOTAL COST	QUANTITY	TOTAL COST	QUANTITY	TOTAL COST
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1011	TRAINING	SF															
1012	MAINTENANCE AND PRODUCTION	SF															
1013	RESEARCH AND DEVELOPMENT	SF															
1014	STORAGE	SF															
1015	MEDICAL	SF															
1016	ADMINISTRATION	SF															
1017	TROOP HOUSING	SF															
1018	COMMUNITY	SF															
1019	OTHER BUILDINGS	SF															
1010	TOTAL - BUILDINGS	SF															
1021	WHARVES AND PIERS	SY															
1022	SEAWALLS, ETC	LF															
1023	DREDGING	CY															
1024	OTHER	CPV															
1020	TOTAL - WATERFRONT																
1031	ROADS AND STREETS	SY															
1032	AIRFIELD PAVEMENTS	SY															
1033	OTHER	SY															
1030	TOTAL - SURFACED AREAS	SY															
1041	IMPROVED	ACRES															
1042	SEMI-IMPROVED & UNIMPROVED	ACRES															
1043	OTHER *(Drains, etc.)*	LF															
1040	TOTAL - GROUNDS																
1051	RAILROAD & CRANE TRACKAGE	MI															
1052	OTHER FACILITIES	CPV															
1053	M & R NON-NAVY REAL PROPERTY	CPV															
1050	TOTAL - STRUCTURE & FACIL.																
1061	ELECTRICAL	KV															
1062	STEAM AND HOT WATER	HP															
1063	WATER	MG															
1064	SEWAGE	MG															
1065	GAS	HP															
1066	OTHER	SF															
1060	TOTAL - UTILITIES PLANT																
1071	ELECTRICAL	LF															
1072	STEAM AND HOT WATER	LF															
1073	WATER	LF															
1074	SEWAGE	LF															
1075	GAS	LF															
1076	COMMUNICATIONS	LF															
1070	TOTAL - UTIL. DISTR. SYSTEM	LF															
1081	FIRE ALARMS	BX															
1082	E/S WORK - REAL PROPERTY	CALLS															
		AVG. HRS/CALLS															
1083	MAINTENANCE SHOP OVERHEAD	%															
1084	MAINTENANCE CONTROL DIV.	%															
1085	MINOR CONSTR - ALTER *($5000 or less)*	%															
1086	DEMOLITION OF BLDG																
1080	TOTAL - OTHER																
1000	TOTAL *(Sum of Lines 1010, 1020, 1030, 1040, 1050, 1060, 1070, and 1080)*																
1100	WORK FOR OTHERS																

BUDGET LINE ITEM	CURRENT YEAR OBLIGATION PLAN BY CUMULATIVE PERCENTAGE (%)											
	JUL	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE
19	20	21	22	23	24	25	26	27	28	29	30	31
1081												

BUDGET LINE ITEM	CURRENT YEAR QUARTERLY ALLOTMENT REQUIREMENT ($)			
	1ST QTR	2ND QTR	3RD QTR	4TH QTR.
32	33	34	35	36
1082				

BUDGET LINE ITEM	ITEM	MAN-YEAR REQUIREMENTS											
		BUDOCKS SUPPORTED						WORK FOR OTHERS					
		PAST YEAR		CURRENT YEAR		BUDGET YEAR		PAST YEAR		CURRENT YEAR		BUDGET YEAR	
		U.S.	F.N.	U.S.	F.N.	U.S.	F.N.	U.S.	F.N.	U.S.	F.N.	U.S.	F.N.
37	38	39	40	41	42	43	44	45	46	47	48	49	50
1083	TOTAL MAN-HOURS												
1084	*LESS* OVERTIME												
1095	STRAIGHT TIME												
1088	MAN-YEARS												
1087	EXCESS MAN-HRS												

ATTACHMENT (D)

(2) Budget Line Item Description and Cost Content

BLI	DESCRIPTION	UNIT OF MEASURE	FUNCTIONAL ACCOUNTS	CATEGORY CODE	NAVCOMPT INVENTORY FORM
	Buildings				
1011	Training Buildings	SF	44324, 325	171	277
1012	Maintenance and Production Bldgs.	SF	44337, 338, 380, 381	211,212,21330, 21390, 214, 215, 216, 21710, 218, 219, 221, 222, 22310, 22390, 224,225, 226, 227, 228, 229	277
1013	Research and Development Buildings	SF	44424, 425	310	277
1014	Storage Buildings	SF	44497, 498	441, 442	267,277
1015	Medical Buildings	SF	44527, 528, 529, 530, 531, 532, 538, 539	510, 520, 530, 540, 550, 530	277 267
1016	Administration Buildings	SF	44540, 541	610	277
1017	Troop Housing Buildings	SF	44575, 576, 583, 584, 591, 592, 597, 598, 602, 603	721, 722, 723, 724	277
1018	Community Buildings	SF	44609, 610, 634, 635	730, 740	277
1019	Other Buildings	SF	44248, 249, 284, 285, 286 287, 465, 489, 490, 544, 606	131, 133, 141, 142 431, 432, 620, 725 421, 422, 620, 725	277 267
1010	Total - Buildings	SF	Sum of BLI 1011 thru 1019		
	Waterfront				
1021	Wharves and Piers	SY	44298, 302	151, 152	267
1022	Seawalls	LF	44307	154	267
1023	Dredging	CY	44323	None	None
1024	Other Waterfront	CPV	44313, 317, 347, 348, 390, 391	153, 159, 161, 162 163, 164, 21310 21320, 22320, 22330 159, 161	267 277
1020	Total - Waterfront	—	Sum of BLI 1021 thru 1024		

BLI	DESCRIPTION	UNIT OF MEASURE	FUNCTIONAL ACCOUNTS	CATEGORY CODE	NAVCOMPT INVENTORY FORM
	Surfaced Areas				
1031	Roads and Streets	SY	44757, 758, 759	851	267
1032	Airfield Pavements	SY	44200, 201, 207, 208, 209	111, 112, 113 116	267
1033	Other Surfaced Areas	SY	44519, 520, 521, 761	451, 452, 852	267
1030	Total - Surfaced Areas	SY	Sum of BLI 1031 thru 1033		
	Grounds				
1041	Improved Grounds	AC	44790, 792	Category Code not specifically assigned. Quantity in acres computed from NavCompt Form 264, Blocks 22a&22b or NavCompt Form 260, Blocks 39a & 39b as applicable.	
1042	Semi-Improved and Unimproved Ground	AC	44794	Category Code not specifically assigned. Quantity in acres computed from NavCompt 264, Blocks 22c or NavCompt Form 262, Block 39c.	
1043	Drainage	LF	44771	871	267
1040	Total - Grounds	---	Sum of BLI 1041 thru 1043		
	Other Structures and Facilities				
1051	Railroad and Crane Trackage	MI	44767	860	267

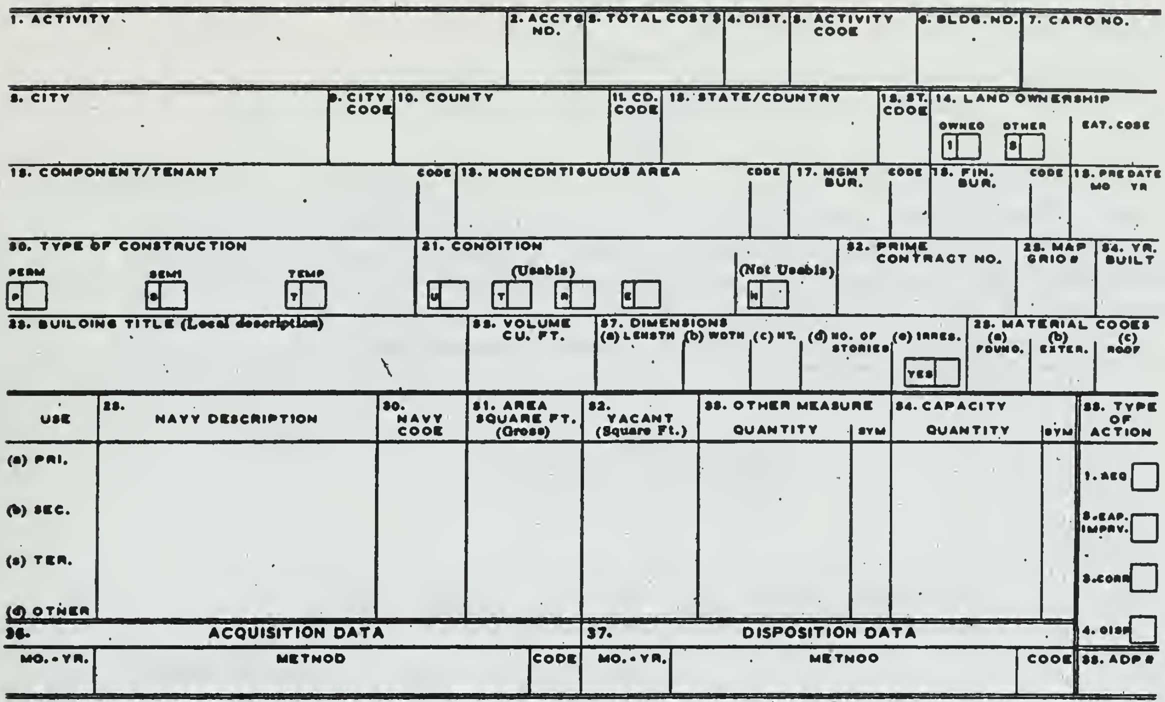
BLI	DESCRIPTION	UNIT OF MEASURE	FUNCTIONAL ACCOUNTS	CATEGORY CODE	NAVCOMPT INVENTORY FORM
1052	Other Facilities	CPV	44218, 230, 236, 264, 278, 280, 297,334, 377, 420, 458, 461, 485, 491, 548, 599, 631, 666, 731, 775, 789, 899* *portion for Class 1 and 2 Plant Property only.	135 -	266
				121, 122, 123, 124, 125, 126, 132, 134, 136, 142, 149, 179, 21180,21190, 21210, 21290, 21340, 21390, 214, 21590, 21690, 21790, 21820, 21830, 21840, 21850, 21890, 21910, 21990, 221, 222, 22390, 224, 225, 226, 22790, 228, 229, 390, 411, 412, 423, 431, 432, 690, 72390, 73090, 750, 833,872	267
				121, 122, 123, 125, 126, 41190, 41290, 423 833, 87290	277
1053	M&R Non-Navy Real Property	CPV	44147	No specific code	
1050	Total - Other Structures and Facilities	---	Sum of BLI 1051 thru 1053		
	Utility Plants				
1061	Electrical Plants	KV	44668	811	267,277
1062	Steam and Hot Water Plants	HP	44686, 688, 698	821	266, 267 277

BLI	DESCRIPTION	UNIT OF MEASURE	FUNCTIONAL ACCOUNTS	CATEGORY CODE	NAVCOMPT INVENTORY FORM
1063	Water Plants	MG	44735	841	266,267, 277
1064	Sewage Plants	MG	44718	831	267, 277,
1065	Gas Plants	HP	44713	823	267, 277
1066	Other Utility Plants	SF	44416, 417, 487, 488, 780 782, 785, 787, 925, 982	890	267, 277
1060	Total - Utility Plants	---	Sum of BLI 1061 thru 1066		
	Utilities Distribution Systems				
1071	Electrical Distribution Systems	LF	44678	812	266, 267, 277
1072	Steam and Hot Water Distribution Systems	LF	44709	822	266
1073	Water Distribution Systems	LF	44746, 748, 751	842, 843	266, 267, 277
1074	Sewage Distribution Systems	LF	44725	832	267, 277
1075	Gas Distribution Systems	LF	44716	824	267, 277
1076	Communications Systems	LF	44279	135 (only that portion pertaining to local administrative telephone system)	266
1070	Total - Utilities Distribution Systems	LF	Sum of BLI 1071 thru 1076		

BLI	DESCRIPTION	UNIT OF MEASURE	FUNCTIONAL ACCOUNTS	CATEGORY CODE	NAVCOMPT INVENTORY FORM
	Other				
1081	Fire Alarms	BX	44777	880	267
1082	Emergency/Service Work	No. of Calls Hrs./Call	44145	None	None
1083	Maintenance Shop Overhead	%BLI 1000	44166	None	None
1084	Maintenance Control Division	% BLI 1000	43711	None	None
1085	Minor Construction-Alteration ($5,000 or less)	% BLI 1000	41100, 41200, 42100, 42200	None	None
1086	Demolition of Buildings and Structures	---	99905	None	None
1080	Total - Other	---	Sum of BLI 1081 thru 1086		
1000	Total - Recurring Maintenance of Real Property	---	Sum of BLI 1010, 1020, 1030, 1040, 1050, 1060, 1070 and 1080		
1100	Work for Others	---	Covers the balance of the PW force performing maintenance of real property functions not chargeable to this plan and budget estimate, i.e. O&M N subhead 2505or RDT&E N subheads 25_3 or 25_8. Report all other funds such as housing funds,reimbursable work, direct citation work etc.		

NOTE: Unit of Measure as indicated in NavDocks P-72, except "CPV" which is Current Plant Value (replacement value).

Appendix I



1. ACTIVITY | 2. ACCTG NO. | 3. TOTAL COST $ | 4. DIST. | 5. ACTIVITY CODE | 6. BLDG. NO. | 7. CARD NO.

8. CITY | 9. CITY CODE | 10. COUNTY | 11. CO. CODE | 12. STATE/COUNTRY | 13. ST. CODE | 14. LAND OWNERSHIP: OWNED 1 ☐ OTHER 2 ☐ | EAT. CODE

15. COMPONENT/TENANT | CODE | 16. NONCONTIGUOUS AREA | CODE | 17. MGMT BUR. | CODE | 18. FIN. BUR. | CODE | 19. PRE DATE MO YR

20. TYPE OF CONSTRUCTION: PERM P ☐ SEMI S ☐ TEMP T ☐ | 21. CONDITION (Usable) U ☐ T ☐ R ☐ E ☐ (Not Usable) N ☐ | 22. PRIME CONTRACT NO. | 23. MAP GRID # | 24. YR. BUILT

25. BUILDING TITLE (Local description) | 26. VOLUME CU. FT. | 27. DIMENSIONS (a) LENGTH (b) WDTH (c) HT. (d) NO. OF STORIES (e) IRREG. YES ☐ | 28. MATERIAL CODES (a) FOUND. (b) EXTER. (c) ROOF

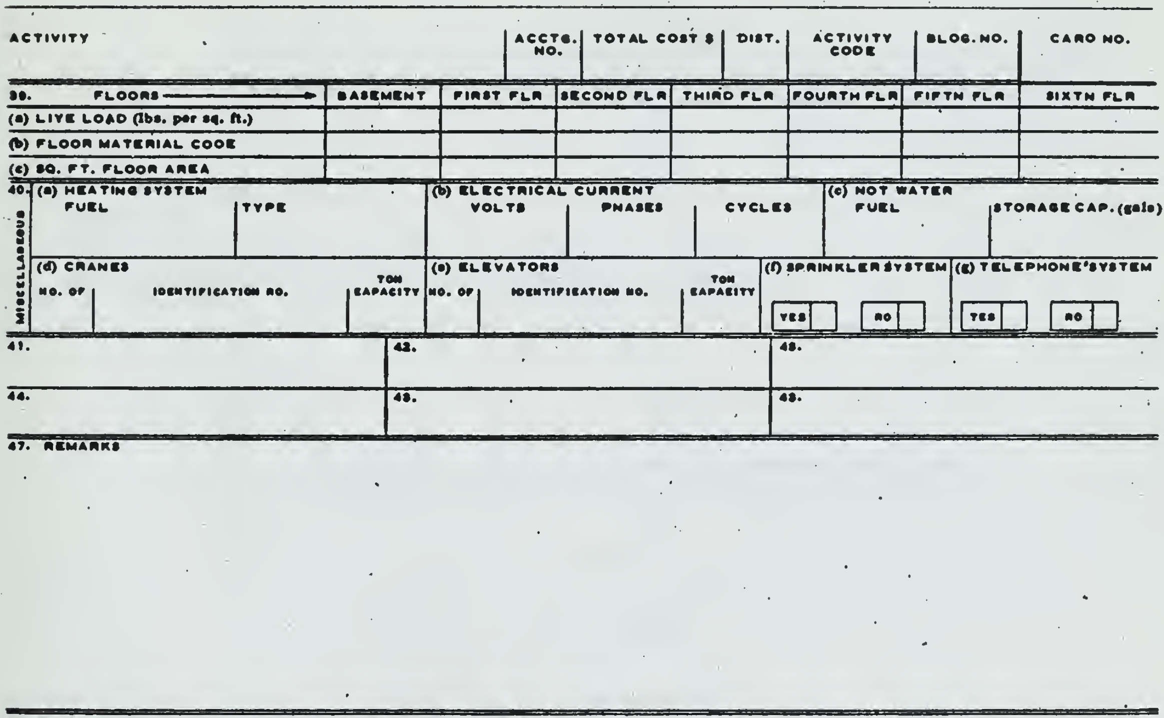
USE	29. NAVY DESCRIPTION	30. NAVY CODE	31. AREA SQUARE FT. (Gross)	32. VACANT (Square Ft.)	33. OTHER MEASURE QUANTITY	SYM	34. CAPACITY QUANTITY	SYM	35. TYPE OF ACTION
(a) PRI.									1. ACQ ☐
(b) SEC.									2. CAP. IMPRV. ☐
(c) TER.									3. CORR ☐
(d) OTHER									4. DISP ☐

36. ACQUISITION DATA: MO.-YR. | METHOD | CODE

37. DISPOSITION DATA: MO.-YR. | METHOD | CODE

38. ADP #

BUILDINGS *(Class II)* **NAVCOMPT FORM 277 (4 PT.) (REV. 5-62) UPPER**



ACTIVITY | ACCTG. NO. | TOTAL COST $ | DIST. | ACTIVITY CODE | BLDG. NO. | CARD NO.

39. FLOORS →	BASEMENT	FIRST FLR	SECOND FLR	THIRD FLR	FOURTH FLR	FIFTH FLR	SIXTH FLR
(a) LIVE LOAD (lbs. per sq. ft.)							
(b) FLOOR MATERIAL CODE							
(c) SQ. FT. FLOOR AREA							

40. MISCELLANEOUS

(a) HEATING SYSTEM: FUEL | TYPE

(b) ELECTRICAL CURRENT: VOLTS | PHASES | CYCLES

(c) HOT WATER: FUEL | STORAGE CAP. (gals)

(d) CRANES: NO. OF | IDENTIFICATION NO. | TON CAPACITY

(e) ELEVATORS: NO. OF | IDENTIFICATION NO. | TON CAPACITY

(f) SPRINKLER SYSTEM: YES ☐ NO ☐

(g) TELEPHONE SYSTEM: YES ☐ NO ☐

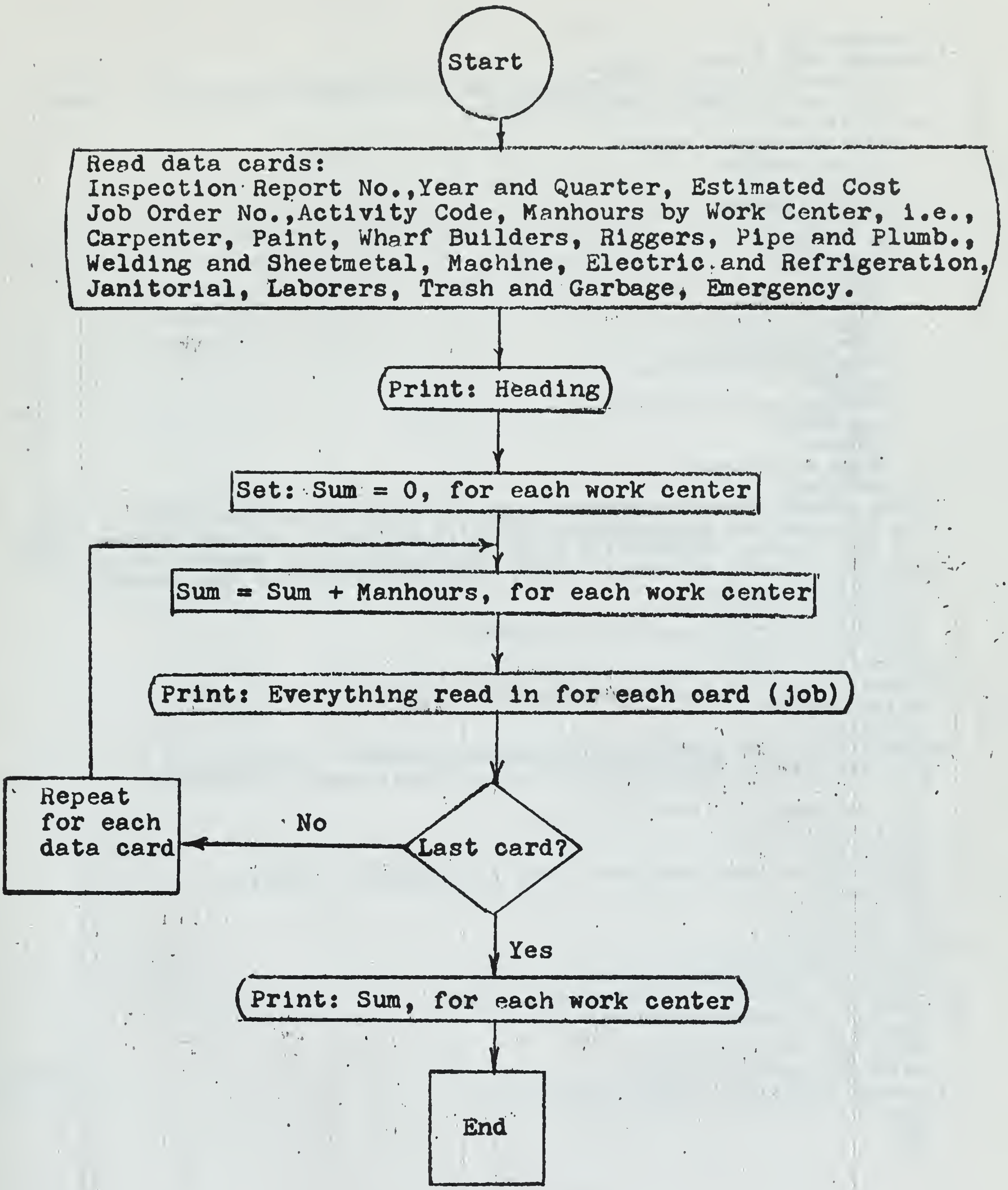
41. | 42. | 43.

44. | 45. | 46.

47. REMARKS

BUILDINGS *(Class II)* **NAVCOMPT FORM 277 (4 PT.) (REV. 5-62) LOWER**

Appendix J

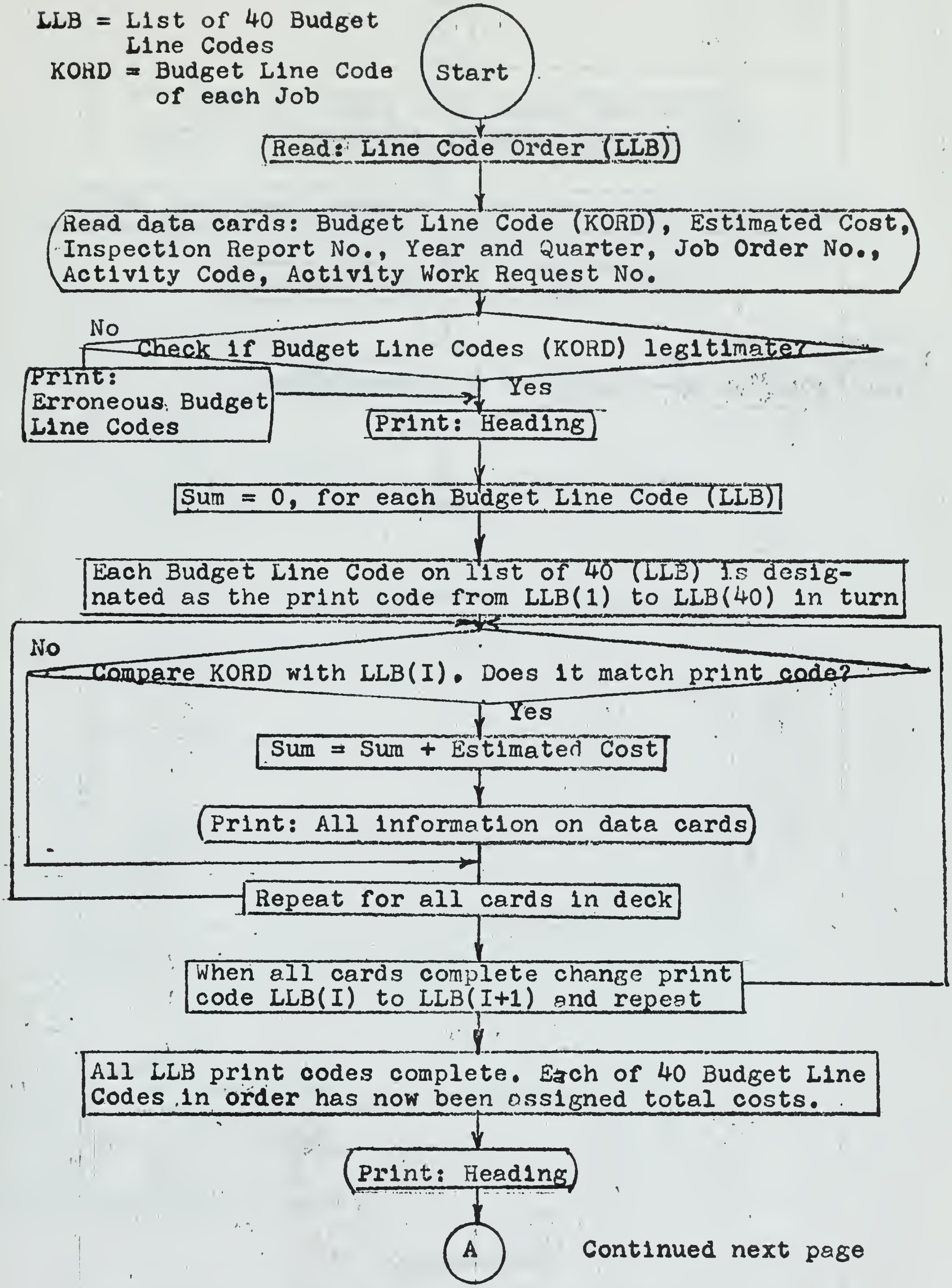

Start
Read data cards:
Inspection Report No.,Year and Quarter, Estimated Cost
Job Order No.,Activity Code, Manhours by Work Center, i.e.,
Carpenter, Paint, Wharf Builders, Riggers, Pipe and Plumb.,
Welding and Sheetmetal, Machine, Electric and Refrigeration,
Janitorial, Laborers, Trash and Garbage, Emergency.
Print: Heading
Set: Sum = 0, for each work center
Sum = Sum + Manhours, for each work center
Print: Everything read in for each card (job)
Last card?
No
Repeat for each data card
Yes
Print: Sum, for each work center
End

FLOW DIAGRAM FOR MANPOWER REQUIREMENTS PROGRAM

```
      PROGRAM PWC 1
C    MANPOWER REQUIREMENTS PROGRAM
C      THIS PROGRAM IS USED TO DETERMINE THE TOTAL MANHOUR REQUIREMENTS BY WORK
C      CENTER OR SHOP OVER A PERIOD OF TIME.
C    JOB VARIABLES.
C      INSPECTION REPORT NUMBER
C      YEAR AND QUARTER
C      ESTIMATED COST
C      JOB ORDER NUMBER
C      ACTIVITY CODE
C      WORK CENTERS
C        CARPENTER
C        PAINT
C        WHARF BUILDERS
C        RIGGERS
C        PIPE AND PLUMBING
C        WELDING AND SHEETMETAL
C        MACHINE
C        ELECTRIC AND REFRIGERATION
C        JANITORIAL
C        LABORERS
C        TRASH AND GARBAGE
C        EMERGENCY
C      WORK CENTERS CAN BE ADJUSTED TO MEET THE NEEDS OF EACH PWC. THERE IS ROOM
C      ON EACH CARD FOR ONE MORE WORK CENTER IF NECESSARY. IF THERE ARE MORE THAN
C      13 WORK CENTERS CONTINUATION CARDS CAN BE USED OR THE PROGRAM CAN BE
C      REVISED TO USE A DIFFERENT SYSTEM. (SUCH AS IDENTIFYING WORK CENTERS BY 2
C      DIGIT CODE NUMBERS)
C      N=NUMBER OF DATA CARDS.
      DIMENSION JA(500,5),A(500,12),SUM(500)
C     READ JOB VARIABLES
      READ 10,N,((JA(I,K),K=1,5),(A(I,L),L=1,12),I=1,N)
   10 FORMAT(I3/(I5,I3,I7,I10,I2,12F4.0))
C     PRINT HEADING
      PRINT 30
   300FORMAT(1H1,119H INSP-NO YR-QTR ES-COST JO-NUMBER  ACT-CODE CARP PA
     1INT WHARF RIGG  PLUMB WELD  MACH  ELEC  JANIT LABOR TRASH EMERG
     2                        )
C     SET SUM EQUAL TO 0 FOR EACH SHOP
      DO 11 J=1,12
   11 SUM(J)=0
C     START THE DO LOOP. READ EACH CARD. ADD MANHOURS TO SUM FOR
C     EACH SHOP
      DO 41 I=1,N
      DO 25 J=1,12
   25 SUM(J)=SUM(J)+A(I,J)
C     PRINT VARIABLES FOR EACH JOB.
      PRINT 40 (JA(I,K),K=1,5),(A(I,L),L=1,12)
   40 FORMAT(/,2I7,I8,I11,I9,12F6.0)
   41 CONTINUE
C     PRINT SUM FOR EACH SHOP.
      PRINT 50,(SUM(J),J=1,12)
   50 FORMAT(/,2X,10H    TOTALS,30X,12F6.0)
      STOP
      END
      END
```

```
INSP-NO YR-QTR ES-COST JO-NUMBER  ACT-CODE  CARP PAINT WHARF  RIGG PLUMB  WELD  MACH  ELEC JANIT LABOR TRASH EMERG
    3     674     3950 6151050003        5     .     .     .    8.  215.   24.   16.     .     .     .     .     .
    9     674      795 6121120009       12     .   96.     .     .     .     .     .     .     .     .     .     .
    5     674     9000 6131030005        3   40.     .  900.   96.     .     .     .     .     .   48.     .     .
   11     674      350 6161010011        1     .     .     .     .     .   40.    8.     .     .     .     .     .
   17     674     2100 6201070017        7     .     .     .     .     .     .     .     .     .  400.     .     .
   18     674     3050 6181090018        9     .     .     .     .     .     .     .  408.     .     .     .     .
   15     674     1000 6121100015       10     .   80.     .     .     .     .     .     .    8.     .     .     .
   13     674     2000 6131040013        4     .     .  108.     .     .     .     .     .     .     .     .     .
   20     674      300    1050020        5     .     .     .     .     .     .     .     .    8.     .     .   48.
    7     674     1115 6111110007       11   48.   16.     .     .   40.     .     .    8.     .   16.    8.    8.
    6     674     1950 6171090006        9     .     .     .     .     .     .  320.     .     .     .     .     .
   12     674     2300 6111030012        3     .  300.     .     .     .     .     .     .     .     .     .     .
    4     674     3000 6211080004        8     .     .     .     .     .     .     .     .     .     .  600.     .
   16     674      400 6131080016        8     .     .   40.    8.     .     .     .     .     .     .     .     .
   14     674     2150 6111060014        6  100.   40.     .     .     .     .     .   16.     .     .     .    8.
   10     674     3000 6191100010       10     .     .     .     .     .     .     .     .  640.     .     .     .
    8     674     3500 6111070008        7  500.    8.     .     .     .     .     .     .   16.     .     .
    2     674     2500 6121100002       10     .  200.     .     .     .     .     .     .     .     .     .   10.
    TOTALS                                   688.  740. 1048.  112.  255.   64.  344.  432.  672.  464.  608.   74.
  STOP
TIME.  0 MINUTES AND  19 SECONDS
```

Appendix K

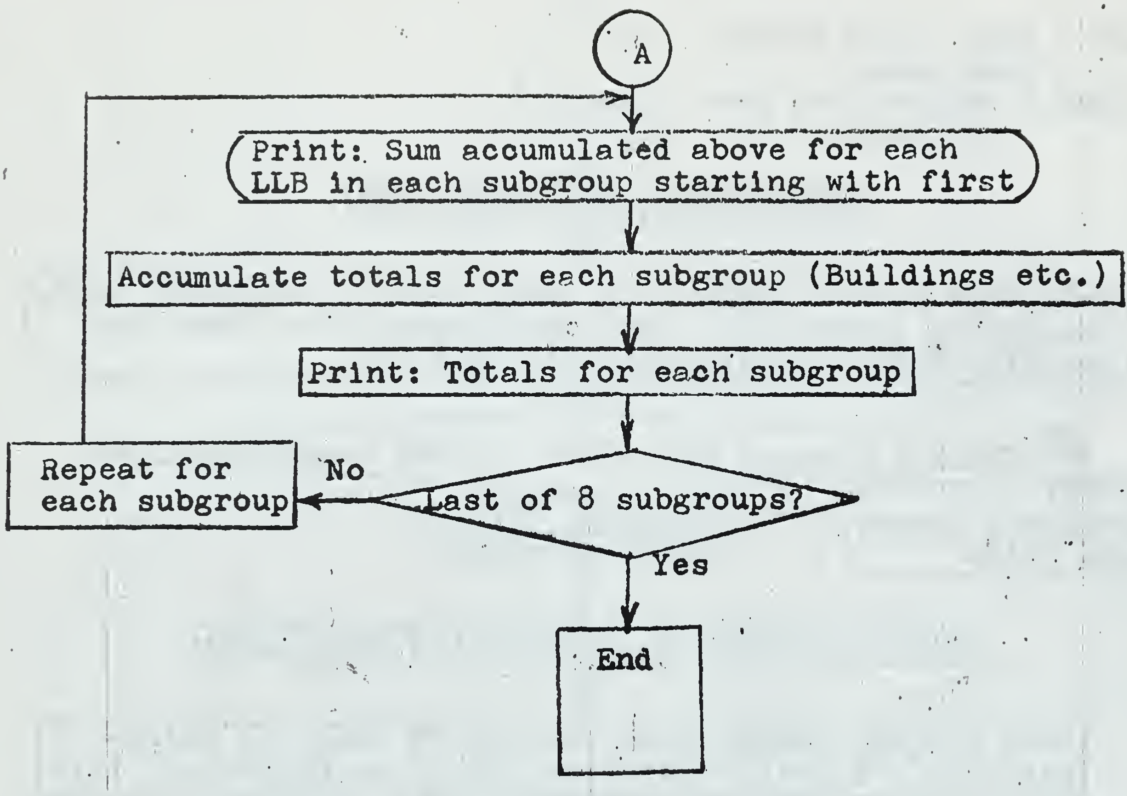


LLB = List of 40 Budget Line Codes
KORD = Budget Line Code of each Job

Start
Read: Line Code Order (LLB)
Read data cards: Budget Line Code (KORD), Estimated Cost, Inspection Report No., Year and Quarter, Job Order No., Activity Code, Activity Work Request No.
No
Check if Budget Line Codes (KORD) legitimate?
Print: Erroneous Budget Line Codes
Yes
Print: Heading
Sum = 0, for each Budget Line Code (LLB)
Each Budget Line Code on list of 40 (LLB) is designated as the print code from LLB(1) to LLB(40) in turn
No
Compare KORD with LLB(I). Does it match print code?
Yes
Sum = Sum + Estimated Cost
Print: All information on data cards
Repeat for all cards in deck
When all cards complete change print code LLB(I) to LLB(I+1) and repeat
All LLB print codes complete. Each of 40 Budget Line Codes in order has now been assigned total costs.
Print: Heading
A

Continued next page

FLOW DIAGRAM FOR BUDGET LINE CODE BACKUP PROGRAM


A
Print: Sum accumulated above for each LLB in each subgroup starting with first
Accumulate totals for each subgroup (Buildings etc.)
Print: Totals for each subgroup
Last of 8 subgroups?
No
Repeat for each subgroup
Yes
End

Continuation of

FLOW DIAGRAM FOR BUDGET LINE CODE BACKUP PROGRAM

```
      PROGRAM PWC 2
C    BUDGET LINE CODE BACKUP REPORT
C      PURPOSE OF PROGRAM IS TO FURNISH BUDGET BACKUP IN TERMS OF ACTUAL
C      PLANNED WORK. COVERS ONLY SPECIFIC JOB ORDERS. DOES NOT INCLUDE RECURRING
C      WORK.
C    JOB VARIABLES
C      KORD=BUDGET LINE CODE
C      KBUD=ESTIMATED COST OF JOB
C      LLB=LIST OF BUDGET LINE CODES
C      LCOST=SUM OF ESTIMATED COSTS BY BUDGET LINE CODE
C      MRN=LIST OF INSPECTION REPORT NUMBERS
C      MYQ=YEAR AND QUARTER FOR ACCOMPLISHMENT
C      MON=JOB ORDER NUMBER
C      MAC=ACTIVITY CODE
C      MAW=ACTIVITY WORK REQUEST NUMBER
      DIMENSION KORD(1000),KBUD(1000),LLB(40),LCOST(40),MRN(1000),
     1MYQ(1000),MON(1000),MAC(1000),MAW(1000)
C      READ LIST OF 40 BUDGET LINE CODES.
      READ 10,(LLB(J),J=1,40)
   10 FORMAT(20I4)
C      N=NUMBER OF DATA CARDS.
C      READ JOB VARIABLES.
      READ 12,N,(KORD(I),KBUD(I),MRN(I),MYQ(I),MON(I),MAC(I),MAW(I),
     1I=1,N)
   12 FORMAT(I3/(I4,2I5,I3,I10,I2,I10))
C      CHECK FOR INCORRECT BUDGET LINE CODES
      DO 5 I=1,N
      KC=
      DO 6 J=1,40
      IF (KORD(I)-LLB(J)) 6,7,6
    7 KC=1
      GO TO 8
    6 CONTINUE
    8 IF(KC-1) 9,5,9
    9 PRINT 2,I,KORD(I)
    2 FORMAT (/,2X,2I5,30H INCORRECT BUDGET LINE CODE              ).
    5 CONTINUE
C      PRINT HEADING.
      PRINT11
   110FORMAT(1H1,2X,75HBLC  EST-COST INS-NO YR-QTR JO-NUMBER ACTY-CODE
     1ACTY-WR-NO                                    )
C      MATCH BUDGET LINE CODE ON EACH CARD WITH LIST OF 40 BUDGET LINE CODES.
C      WHEN MATCHED PRINT EACH JOB VARIABLE IN BUDGET LINE CODE ORDER.
      DO 50 J=1,40
      JSUM=0
      DO 17 I=1,N
      IF(KORD(I)-LLB(J)) 17,16,17
   16 JSUM=JSUM+KBUD(I)
      PRINT 20,KORD(I),KBUD(I),MRN(I),MYQ(I),MON(I),MAC(I),MAW(I)
   20 FORMAT(/,2X,I4,I8,2I7,I13,I6,I11)
   17 CONTINUE
C      STORE SUMS FOR EACH OF 40 BUDGET LINE CODES
   50 LCOST(J)=JSUM
      PRINT 52
   52 FORMAT(1H1,2X,20HBLC   EST-COST                                  )
      DIMENSION KSUM(8)
      KB=1010
      J=1
C     SUMMARIZE SUMS OF EACH BUDGET LINE CODE IN 8 GROUPS OF 10.
      DO 106 I=1,8
      KB=KB+10
      KSUM(I)=0
C     PRINT TOTALS FOR EACH BUDGET LINE CODE
   60 IF(LLB(J)-KB) 61,66,66
   61 PRINT 62,LLB(J),LCOST(J)
   62 FORMAT(/,2X,I4,I8)
      KSUM(I)=KSUM(I)+LCOST(J)
      J=J+1
      IF(J-40) 60,60,66
   66 IF(1-(I))71,67,70
C     PRINT TOTAL FOR EACH OF 8 GROUPS OF 10.
   67 PRINT 68,KSUM(I)
   68 FORMAT(/,7X,I7,2X,30H TOTAL BUILDINGS ESTIMATED            )
   69 GO TO 106
   70 STOP 1
   71 IF(2-(I)) 76,72,75
   72 PRINT 73,KSUM(I)
   73 FORMAT(/,7X,I7,2X,30H TOTAL WATERFRONT ESTIMATED           )
   74 GO TO 106
   75 STOP 2
   76 IF(3-(I)) 81,77,80
   77 PRINT 78,KSUM(I)
   78 FORMAT(/,7X,I7,2X,35H TOTAL SURFACED AREAS ESTIMATED              )
   79 GO TO 106
   80 STOP 3
   81 IF(4-(I)) 86,82,85
   82 PRINT 83,KSUM(I)
   83 FORMAT(/,7X,I7,2X,30H TOTAL GROUNDS ESTIMATED              )
   84 GO TO 106
   85 STOP 4
   86 IF(5-(I)) 91,87,90
   87 PRINT 88,KSUM(I)
   88 FORMAT(/,7X,I7,2X,44H TOTAL STRUCTURES AND FACILITIES ESTIMATED   )
   89 GO TO 106
   90 STOP 5
   91 IF(6-(I)) 96,92,95
   92 PRINT 93,KSUM(I)
   93 FORMAT(/,7X,I7,2X,40H TOTAL UTILITIES PLANTS ESTIMATED           )
   94 GO TO 106
   95 STOP 6
   96 IF(7-(I))101,97,100
   97 PRINT 98,KSUM(I)
   98 FORMAT(/,7X,I7,2X,44H TOTAL UTILITIES DIST SYSTEMS ESTIMATED      )
   99 GO TO 106
  100 STOP 7
  101 IF(8-(I)) 105,102,105
  102 PRINT 103,KSUM(I)
  103 FORMAT(/,7X,I7,2X,30H TOTAL OTHER ESTIMATED                )
  104 GO TO 106
  105 STOP 8
  106 CONTINUE
      STOP


      END
      END
```

58 128 INCORRECT BUDGET LINE CODE

BLC	EST-COST	INS-NO	YR-QTR	JO-NUMBER	ACTY-CODE	ACTY-WR-NO
1011	730	3	674	6121020003	2	166
1011	520	2	674	6111010002	1	166
1012	921	4	674	6151070004	7	166
1012	1100	5	674	6181090005	9	166
1013	312	6	674	6111100006	10	166
1013	210	7	674	6111120007	12	166
1014	834	8	674	6121110008	11	166
1014	769	9	674	6181050009	5	166
1015	671	10	674	6121040010	4	166
1015	340	11	674	6111010011	1	166
1016	221	12	674	6111030012	3	266
1016	119	13	674	6111060013	6	166
1017	519	15	674	6121050015	5	266
1017	403	14	674	6121040014	4	166
1019	168	18	674	6111110018	11	266
1019	702	19	674	6121120019	12	266
1021	145	20	674	6111010020	1	266
1021	799	21	674	6111040021	4	466
1022	1000	23	674	6201020023	2	566
1023	3550	24	674	6131030024	3	566
1023	150	25	674	6131040025	4	566
1024	2000	27	674	6131060027	6	666
1041	150	34	674	6201110034	11	366

```
 BLC   EST-COST
1011     1250
1012     2021
1013      522
1014     1603
1015     1011
1016      340
1017      922
1018        0
1019      870
         8539   TOTAL BUILDINGS ESTIMATED
1021      944
1022     1000
1023     3700
1024     2000
         7644   TOTAL WATERFRONT ESTIMATED
1031        0
1032        0
1033        0
            0   TOTAL SURFACED AREAS ESTIMATED
```

1041	850	
1042	700	
1043	950	
	2500	TOTAL GROUNDS ESTIMATED
1051	575	
1052	241	
1053	595	
	1411	TOTAL STRUCTURES AND FACILITIES ESTIMATED
1061	540	
1062	562	
1063	922	
1064	950	
1065	1203	
1066	1115	
	5292	TOTAL UTILITIES PLANTS ESTIMATED

```
 1071    1179

 1072     659

 1073    2400

 1074    1300

 1075    1000

 1076     425

         6963   TOTAL UTILITIES DIST SYSTEMS ESTIMATED

 1081    5190

 1082   33000

 1083       0

 1084       0

 1085   10000

 1086   10000

        58190   TOTAL OTHER ESTIMATED
  STOP
TIME,  0 MINUTES AND  59 SECONDS
```

Appendix L

```
      PROGRAM PWC 3
C    MAINTENANCE COST SUMMARY
C      THIS PROGRAM PROVIDES BOTH ESTIMATED AND ACTUAL COSTS FOR THE MAINTENANCE
C      COST SUMMARY. CAN INCLUDE RECURRING WORK IF DESIRED AND DATA CARDS ARE
C      PROVIDED.
C    JOB VARIABLES
C      KORD=BUDGET LINE CODE
C      KBUD=ESTIMATED COST OF JOB
C      LLB=LIST OF BUDGET LINE CODES
C      LCOST=SUM OF ESTIMATED COSTS BY BUDGET LINE CODE
C      MRN=LIST OF INSPECTION REPORT NUMBERS
C      MYQ=YEAR AND QUARTER FOR ACCOMPLISHMENT
C      MON=JOB ORDER NUMBER
C      MAC=ACTIVITY CODE
C      MAW=ACTIVITY WORK REQUEST NUMBER
C      KACT=ACTUAL COST
      DIMENSION KORD(1000),KBUD(1000),LLB(40),LCOST(40),MRN(1000),
     1MYQ(1000),MON(1000),MAC(1000),MAW(1000),KACT(1000),LACT(40)
C      READ LIST OF 40 BUDGET LINE CODES
      READ 10,(LLB(J),J=1,40)
   10 FORMAT(20I4)
C      N=NUMBER OF DATA CARDS.
C      READ JOB VARIABLES
      READ 12,N,(KORD(I),KBUD(I),MRN(I),MYQ(I),MON(I),MAC(I),MAW(I),
     1KACT(I),I=1,N)
   12 FORMAT(I3/(I4,2I5,I3,I10,I2,I10,I5))
C      CHECK FOR INCORRECT BUDGET LINE CODES
      DO 5 I=1,N
      KC=
      DO 6 J=1,40
      IF (KORD(I)-LLB(J)) 6,7,6
    7 KC=1
      GO TO 8
    6 CONTINUE
    8 IF(KC-1) 9,5,9
    9 PRINT 2,I,KORD(I)
    2 FORMAT (/,2X,2I5,30H INCORRECT BUDGET LINE CODE              )
    5 CONTINUE
C      PRINT HEADING.
      PRINT11
   110FORMAT(1H1,2X,75HBLC    EST-COST INS-NO YR-QTR JO-NUMBER ACTY-CODE
     1ACTY-WR-NO ACTUAL-COST                                     )
C      MATCH LIST OF 40 BUDGET LINE CODES WITH BUDGET LINE CODE ON EACH CARD.
C      WHEN MATCHED PRINT EACH JOB VARIABLE IN BUDGET LINE CODE ORDER.
      DO 50 J=1,40
      JSUM=0
      LSUM=0
      DO 17 I=1,N
      IF(KORD(I)-LLB(J)) 17,16,17
   16 JSUM=JSUM+KBUD(I)
      LSUM=LSUM+KACT(I)
      PRINT 20,KORD(I),KBUD(I),MRN(I),MYQ(I),MON(I),MAC(I),MAW(I),
     1KACT(I)
   20 FORMAT(/,2X,I4,I8,2I7,I13,I6,I11,I13)
   17 CONTINUE
C      STORE SUMS FOR ESTIMATED AND ACTUAL COSTS CORRESPONDING TO EACH BUDGET
```

```
C     LINE CODE.
      LACT(J)=LSUM
   50 LCOST(J)=JSUM
      DIMENSION KSUM(8),MSUM(8)
C     PRINT HEADING
      PRINT 52
   52 FORMAT(1H1,2X,30HBLC   EST-COST ACTUAL-COST                      )
      KB=1010
      J=1
C     SUMMARIZE SUMS OF ESTIMATED AND ACTUAL COSTS IN 8 GROUPS OF 10.
      DO 106 I=1,8
      KP=KB+10
      KSUM(I)=0
      MSUM(I)=0
   60 IF(LLB(J)-KB) 61,66,66
C     PRINT TOTAL ESTIMATED AND ACTUAL COST FOR EACH BUDGET LINE CODE
   61 PRINT 62,LLB(J),LCOST(J),LACT(J)
   62 FORMAT(/,2X,I4,I8,I12)
      KSUM(I)=KSUM(I)+LCOST(J)
      MSUM(I)=MSUM(I)+LACT(J)
      J=J+1
      IF(J-40) 60,60,66
C     PRINT TOTAL ESTIMATED AND ACTUAL COSTS FOR EACH OF THE 8 GROUPS OF 10.
   66 IF(1-(I))71,67,70
   67 PRINT 68
   68 FORMAT(/,2X,20HTOTAL BUILDINGS                      )
      PRINT 55,KSUM(I),MSUM(I)
   55 FORMAT(/,6X,I8,I12)
   69 GO TO 106
   70 STOP 1
   71 IF(2-(I)) 76,72,75
   72 PRINT 73
   73 FORMAT(/,2X,20HTOTAL WATERFRONT                      )
      PRINT 55,KSUM(I),MSUM(I)
   74 GO TO 106
   75 STOP 2
   76 IF(3-(I)) 81,77,80
   77 PRINT 78
   78 FORMAT(/,2X,25HTOTAL SURFACED AREAS                 )
      PRINT 55,KSUM(I),MSUM(I)
   79 GO TO 106
   80 STOP 3
   81 IF(4-(I)) 86,82,85
   82 PRINT 83
   83 FORMAT(/,2X,20HTOTAL GROUNDS                        )
      PRINT 55,KSUM(I),MSUM(I)
   84 GO TO 106
   85 STOP 4
   86 IF(5-(I)) 91,87,90
   87 PRINT 88
   88 FORMAT(/,2X,35HTOTAL STRUCTURES AND FACILITIES            )
      PRINT 55,KSUM(I),MSUM(I)
   89 GO TO 106
   90 STOP 5
   91 IF(6-(I)) 96,92,95
   92 PRINT 93
```

```
 93 FORMAT(/,2X,35HTOTAL UTILITIES PLANTS                       )
    PRINT 55,KSUM(I),MSUM(I)
 94 GO TO 106
 95 STOP 6
 96 IF(7-(I))101,97,100
 97 PRINT 98
 98 FORMAT(/,2X,40HTOTAL UTILITIES DISTRIBUTION SYSTEMS            )
    PRINT 55,KSUM(I),MSUM(I)
 99 GO TO 106
100 STOP 7
101 IF(8-(I)) 105,102,105
102 PRINT 103
103 FORMAT(/,2X,20HTOTAL OTHER                           )
    PRINT 55,KSUM(I),MSUM(I)
104 GO TO 106
105 STOP 8
106 CONTINUE
    STOP
    END
    END
    28 1096 INCORRECT BUDGET LINE CODE


 BLC   EST-COST  INS-NO  YR-QTR  JO-NUMBER  ACTY-CODE  ACTY-WR-NO  ACTUAL-COST
1011     730       3      674    6121020003     2          166          725
1012     921       4      674    6151070004     7          166          900
1012    1100       5      674    6181090005     9          166         1110
1013     312       6      674    6111100006    10          166          300
1014     210       7      674    6111120007    12          166          200
1014     834       8      674    6121110008    11          166          850
1014     769       9      674    6181050009     5          166          770
1015     340      11      674    6111010011     1          166          325
1015     671      10      674    6121040010     4          166          650
1016     119      13      674    6111060013     6          166          125
1016     221      12      674    6111030012     3          266          200
1017     403      14      674    6121040014     4          166          400
1018     535      17      674    6181030017     3          366          525
1019     702      19      674    6121120019    12          266          700
1019     168      18      674    6111110018    11          266          160
1021     799      21      674    6111040021     4          466          800
1021     145      20      674    6111010020     1          266          147
1022    1000      23      674    6201020023     2          566          999
1022     500      22      674    6201010022     1          366          499
1023     150      25      674    6131040025     4          566          148
1023    3550      24      674    6131030024     3          566         3500
1024    2000      27      674    6131060027     6          666         1995
```

```
 BLC   EST-COST ACTUAL-COST
1011      730          725
1012     2021         2010
1013      312          300
1014     1813         1820
1015     1011          975
1016      340          325
1017      403          400
1018      535          525
1019      870          860
TOTAL BUILDINGS
         8035         7940
1021      944          947
1022     1500         1498
1023     3700         3648
1024     2295         2295
TOTAL WATERFRONT
         8439         8388
1031        0            0
1032     5270         5200
1033      800          798
TOTAL SURFACED AREAS
         6070         5998
```

```
1071    1179        1291
1072     659         670
1073    2400        2632
1074    1300        1410
1075    1000        1015
1076     425         435
TOTAL UTILITIES DISTRIBUTION SYSTEMS
        6963        7453
1081    5190        5295
1082   33000       32700
1083       0           0
1084       0           0
1085   10000       10110
1086    5000        5005
TOTAL OTHER
       53190       53110
 STOP
TIME,  1 MINUTES AND   4 SECONDS
```

1041	0	0
1042	200	199
1043	950	971
TOTAL GROUNDS		
	1150	1170
1051	575	568
1052	241	250
1053	595	610
TOTAL STRUCTURES AND FACILITIES		
	1411	1428
1061	540	560
1062	1262	1275
1063	922	900
1064	950	970
1065	303	300
1066	950	999
TOTAL UTILITIES PLANTS		
	4927	5004

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13. ABSTRACT

Public Works Centers have recently emerged as a new type of organization for accomplishment of the Navy's maintenance function at large naval bases. They are distinctly different from the older organizations for maintenance. Chapter I reviews this difference.

The purpose of this study is to review the various phases of planning and control of the maintenance function in the new PWC environment, yet considering older organizational methods. Chapter II describes current methods and Chapter III presents a proposed system for improving work input and control functions. The intent is to provide a reasonable and basic approach to these functions through the use of automatic data processing equipment.

The PWCs have great potential for use of new computer systems. This potential, which has been recognized by the Navy Facilities Engineering Command, is reviewed in the study. Although specific proposals are limited to work input and control, other potential applications are discussed in Chapter IV.

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14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
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